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Pouch Qualification from Form/Fill/Seal Machine
(Short Term Project - STP #23)

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6. AUTHOR(S)

T. Deseovich, H.B. Bruins, N. Litman and K. Yam

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Rutgers, The State University of New Jersey
The Center for Advanced Food Technology
Cook College, NJ Agricultural Experiment Station
New Brunswick, NJ 08903

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Defense Logistics Agency
8725 John J. Kingman Road
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13. ABSTRACT *(Maximum 200 words)*

Horizontal Form/Fill/Seal machines (HFFS) are used by several companies to produce shelf stable food products in pouches. This equipment is especially suited to packaging large items such as ham slice or chicken breast. Such products have been purchased to meet limited requirements, but have not been officially approved for routine purchasing, nor are the companies using that equipment considered part of the planned industrial base. The objective of this Project was to produce sufficient quantities of MRE pouches to be tested by Natick RD&EC using new formable foil laminates and the HFFS at the CRAMTD Demonstration Site. The scope of this project included packaging film development and testing, equipment acquisition and modification, development of processing conditions, ingredient purchases, production of MRE pouch test articles and support to industry. The test articles submitted to Natick RD&EC were found favorably compared to data collected for MREs produced by the traditional manufacturing method. Steps have been undertaken by the military to modify MIL-P-47023 allowing HFFS MRE production and to expand the manufacturing base through acquisition of HFFS equipment.

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COMBAT RATION ADVANCED MANUFACTURING TECHNOLOGY DEMONSTRATION (CRAMTD)

"Pouch Qualification from Form/Fill/Seal Machine"

Short Term Project (STP) #23

FINAL TECHNICAL REPORT
Results and Accomplishments (June 1993 through December 1995)
Report No. CRAMTD STP #23 - FTR16.0
CDRL Sequence A004
June 1996

CRAMTD CONTRACT NO. DLA900-88-D-0383
CLIN 0003

Sponsored by:
DEFENSE LOGISTICS AGENCY
8725 John J. Kingman Road
Ft. Belvoir, VA 22060-6221

Contractor:
Rutgers, The State University of New Jersey
THE CENTER FOR ADVANCED FOOD TECHNOLOGY*
Cook College
N.J. Agricultural Experiment Station
New Brunswick, New Jersey 08903

Principal Investigator:
Theodore Descovich

Co-Principal Investigators:
H.B. Bruins, N. Litman, K.Yam

Dr. John F. Coburn
Program Director

TEL: 908-445-6132
FAX: 908-445-6145

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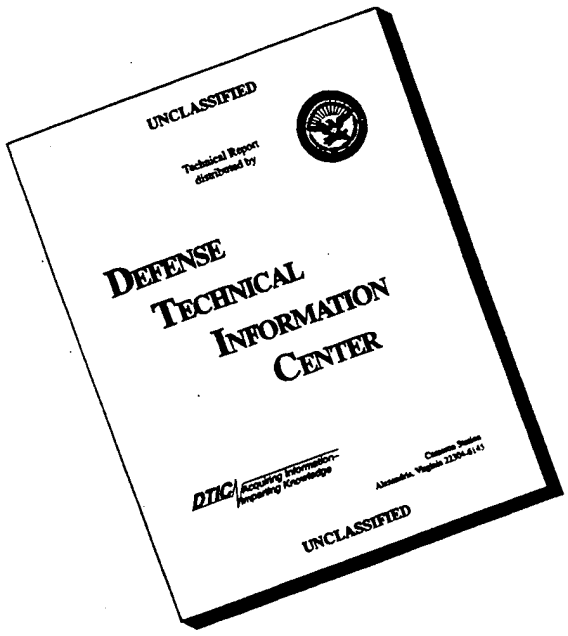

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Contents

1.0 CRAMTD STP #23
Results and Accomplishments

1.1 Executive Summary

The objective of this Short Term Project was to produce sufficient quantities of MRE pouches as test articles to be tested by Natick Research, Development and Engineering Center using new formable foil laminates and the Horizontal Form/Fill/Seal Machine at the CRAMTD demonstration site. The scope of this project included packaging film development and testing, equipment acquisition and modification, development of processing conditions, ingredient purchases, production of MRE pouch test articles and support to industry. The test articles submitted to Natick RD&EC for acceptance were found favorably compared to data collected for MREs produced by the traditional manufacturing method. Steps have been undertaken by the military to implement modifications to MIL-P-47023 allowing HFFS MRE production and to expand the manufacturing base through acquisition of HFFS equipment.

1.2 Introduction and Background

Horizontal form-fill-seal machines are being used by several companies in industry to produce shelf stable food products in pouches. This equipment is especially suited to packaging large particulate items (placeables) such as ham slice or chicken breasts. Such products have been purchased on occasion to meet limited requirements, but they have not been officially approved for routine purchasing, nor are the companies using that equipment considered part of the planned industrial base. To expand the useable industrial base to meet surge and mobilization requirements, and to increase productivity of current producers, it was necessary to achieve full approval of products from this kind of equipment. The technology for use of HFFS machines to produce retortable food pouches has been installed in the CRAMTD Demonstration Site and has been shown to be effective[1]. Various materials approved by FDA and made in the US are being made available by CRAMTD Coalition members, and test articles are required for acceptance testing and approval by the US Army Natick Research, Development and Engineering Center.

[1] "Design and Development of a Horizontal Form/Fill/Seal Machine for an Automated Combat Ration Manufacturing Facility" Short Term Project #8, Final Report, STP Results and Accomplishments (October 1989 to September 1991) Report No. CRAMTD STP #8 - FTR 2.0, CDRL Sequence A004, May 1992, Rutgers, The State University of New Jersey, The Center for Advanced Food Technology, Cook College

1.3 Results

Laminated film structure for producing MRE pouches on a HFFS production line was developed between Rutgers, Reynolds Metal Co. and its material suppliers that meet the requirements of MIL-P-44073 (Appendices 4.2 and 4.3). These structures are designated by Reynolds as Item Code No. 18244 for bottom forming web and No. 18242 for non-forming top web. The bottom web consists of; stretchable temper aluminum foil of increased gage thickness (0.00175 inch), oriented polypropylene (OPP) outer layer for scratch resistance and formability, and improved pigmented adhesive (reduces delamination and simplifies production). The top web structure also benefited from the technological improvements with the incorporation of improved adhesives which reduce delamination. In a separate effort, the military approved Exxon XPP399 polypropylene for the inner food contact/sealant layer. The XPP399 material was used in the final accepted MRE laminate structure.

Evaluation of several internal adhesive systems, the bond between cast polypropylene and foil barrier, identified Morton adhesive superior to Morprime adhesive. Morprime was used in a previously rejected structure because pouches experienced weak seals after retort. Seal strength for the laminate with Morton adhesive was found 20-25% stronger (tensile test), Appendix 4.4, and produced burst pressures higher than preformed pouches. Tests indicate these Morton laminates are the most consistent seals of all films tested and are least affected by forming or retort.

A production quantity of top and bottom laminate using Morton adhesive was produced by Reynolds and sent to Rutgers for qualification testing. This film was rejected due to bottom web exterior delamination and color change. This was an unexpected result since there was no occurrence of this problem in the two previous film productions.

Exterior adhesive supplier, Valspar, was brought in to determine the cause of delamination between the OPP and foil barrier. Testing of several adhesive/catalyst systems by Valspar led to an improved system. Reynolds produced 20,000 yards of top and bottom laminate with the new adhesive. Valspar test results were later confirmed by Rutgers however color changes were not entirely eliminated. This film was used for production of First Article samples.

First Article samples were evaluated by Natick RD&EC personnel for survivability under rough handling, ASTM Drop Test D775-80 and Vibration Test D999-75. The test results were then compared with historical data compiled for pre-formed pouches, Appendix 4.5. Pouches tested at ambient temperature were free of leaks. Pouches tested at -20F had a failure rate approximately 1/3 of pre-formed pouches and leaks occurred primarily through the thinner lid. Only minor delamination and foil flex cracks were observed. These results were favorable for HFFS pouches, consequently Natick accepted the First Article production.

Natick issued document changes to MIL-P-44073D effective March 30, 1995 for use of HFFS MRE pouches (Appendix 4.6).

1.4 Conclusions

Horizontal Form-Fill-Seal production method and formable foil laminate structures produce MRE pouches that meet or exceed requirements of MIL-P-44073. This production method has the following benefits over the vertical pouch:

- reduced material cost of rollstock versus pre-made pouches
- reduced material handling - no pouch magazine to feed
- higher survivability under rough handling
- improved control of residual air - required for placeables foods
- easier pouch loading for placeables
- manufacturing flexibility for various package size, package material, vacuum, Modified Atmosphere Packaging

Although not proven, the thicker aluminum layer in the bottom web may improve resistance to holes and tear defects that occur from production handling and processing. Hole and tear defects account for 22% (84 of 374 lots) of lot rejections, the largest reject category.

1.5 Recommendations

Reynolds Metal formable foil laminate film is recommended for MRE production on HFFS machines. Due the complex demands on the laminate, any changes should be requalified by Natick. Film produced by other laminators should be required to submit test articles to Natick for evaluation.

2.0 Program Management

This STP was proposed as a single phase work activity as illustrated on the "CRAMTD STP #23 Pouch Qualification Projected Time & Events and Milestones" (Appendix 4.1). The scope of this project was to:

- work with vendors to identify, order, inspect and accept sufficient materials and ingredients to produce the test articles.
- produce the required quantity of test articles to fully support acceptance testing, plus additional articles under alternate conditions if any of the tests are failed and retesting is necessary.
- documentation that can be used for substantiation of recommendations for future changes,

as well as for technology transfer and training.

Detailed objectives, statement of work and CRAMTD personnel responsibilities are described in the Technical and Cost Proposals for STP #23.

2.1 Summary of STP Accomplishments

- In November 1992, film supplier Reynolds Metal reports inadequate bond strengths between inner cast polypropylene and aluminum foil due to an adhesive that degrades when subjected to retort conditions. Reynolds will produce three samples with different adhesives for CRAMTD evaluation.
- Short Term Project #23 is drafted in March, 1993, and the delivery order was received in October, 1993 having a retroactive start of June, 1993.
- Extensive laboratory testing identified Morton adhesive significantly improves seal strength for internal foil/PP laminate. An order is placed with Reynolds for 32,000 yds of MRE film with the new adhesive.
- Five companies attended a prebid conference for an MRE pouch cartoning machine. The proposal from Econocorp was selected based on 5 predetermined criteria. The cartoner is needed to package 10,000 pouches.
- Reynolds film is received in September, 1993. The improved film meets seal strength requirements however is experiencing a defect in the pigmented outer adhesive layer; film demonstrates tendency to delaminate and pigment color to blush (turns bluish) due to exposure to retort temperature where the film is drawn. Reynolds and adhesive supplier Valspar re-evaluate formulation and converting process.
- The Econocorp cartoner is installed and accepted at the CRAMTD pilot plant in April, 1994.
- Valspar identifies catalyst as problem, film samples produced with new outer layer adhesive system, results show improved resistance to delamination and color change.
- Reynolds produces 20,000yds of bottom rollstock incorporating new pigmented adhesive system and recently approved XPP399 cast polypropylene seal laminate, the film is delivered August 1994.
- First article production of Ham Slice and Beef Stew (8 cases each) are completed October 1994 and shipped to Natick Research, Development and Engineering Center for testing.
- Natick conducts ASTM Drop and Vibration tests on pouches. The failure rate was

significantly lower than the rate for standard pre-formed pouches.

- Natick releases modifications to MIL-P-44073 that permit MRE production on HFFS equipment.
- Supported DPSC Equipment Initiative for HFFS by helping develop machine requirements. This initiative will place a HFFS production line in each of six MRE pouch producers, thereby significantly expanding the capacity of the manufacturing base.

3.0 Short Term Project Activities

3.1 Establish Material Specification (Section Reference #3.3.1)

Material specifications for food ingredients and foil laminates are found in Appendix 4.7.

3.2 Acceptance Testing and Inspection (Section Reference #3.3.2)

Test and inspections were conducted to determine the acceptability of foil laminate packaging materials for the MRE. Three primary activities were accomplished during this project; interior adhesive evaluation, exterior adhesive evaluation and bottom web formability.

Internal adhesives testing as outlined by Appendix 4.8 was designed to identify adhesive that would yield best seal strengths. Seal testing was conducted on films produced on the Reynolds pilot plant laminator made with 3 adhesive systems, preformed pouches and commercial films. Test results are reported in Appendix 4.9.

Exterior adhesive tests were conducted by Valspar and Rutgers to correct a delamination problem of the outer OPP laminate. The tests were carried out on Rutgers' benchtop pouch forming tool due to very limited quantities of films were produced. These results are reported in Appendix 4.10.

Tests on the Reynolds film were made prior to the qualification run to determine optimum profile and volume of the formed pouch. The series of experiments are documented in Appendix 4.11. A flow control valve on the air assist forming system was added after the qualification run to adjust the rate of forming to further enhance control of the formed profile.

3.3 Equipment Specification and Acquisition (Section Reference #3.3.3)

Racks for the Stock 1300mm retort on loan from DPSC were purchased from an MRE producer. These racks (approximately 500) increased retort capacity to greater than 2000 pouches per batch. CRAMTD capacity prior to installation of the commercial retort was approximately 375 pouches. In addition, suitable retort cages were purchased from Stock America because proper cages were not included with the retort.

Pouch Cartoning Machine Specifications (Appendix 4.12) were developed for CRAMTD production requirements. Rutgers purchasing procedures were followed; held a Pre-bid Conference with potential vendors (6 were invited), evaluated sealed bid proposals (Appendix 4.13), requested subcontract approval from the military (Appendix 4.14), and prepared subcontract documents. The Econocorp Spartan Cartoning Machine was selected over proposals from Adco, Hoyer and Scandia based on six weighted criteria; performance, engineering features, cost, delivery, service and training.

Pouch internal pressure testing equipment was not purchased from Reynolds (Reycon Tester) because the subcontractor was no longer in business. Nor from a second machine manufacturer who quoted a fabrication cost of $15,000. The existing CRAMTD tester, although completely manually operated, was acceptable for collecting the necessary data.

3.4 Production Process Definition (Section Reference #3.3.4)

The production process for Beef Stew and Ham Slice MRE is defined by the CRAMTD Partial Quality Control (PQC) Program for Shelf Stable Products, dated June 1994. This document is available upon request as CRAMTD Technical Working Paper No. 90. Contact The Center for Advanced Food Technology, Rutgers University, Food Manufacturing Technology Facility, 120 New Englsnd Ave., Piscataway, NJ 08854; phone (908) 445-6130; FAX (908) 445-6145.

3.5 Test Article Production (Section Reference #3.3.5)

The plan for qualification runs was amended (Appendix 4.15) to produce 8 cases each of Beef Stew and Ham Slice. Each case contains 72 pouches. These pouches were produced between September 27 and October 27, 1994. Production and Quality Control records were kept for each lot, typical records are included for Ham Slice as Appendix 4.16 and Beef Stew as Appendix 4.17. The Tiromat SMART System Operating Program included as Appendix 4.18 documents the equipment parameters used for producing the test article pouches.

3.6 Coordination of other CRAMTD Projects (Section Reference #3.3.6)

During this period, the CRAMTD HFFS machine and development packaging materials were used in conjunction with other STPs and military projects;

STP #2 Filling Systems

STP #14 Engineering Systems for Material Handling

STP #20 Dual Use Manufacturability

STP #21 Prototype Seal Integrity Inspection

QQECR Quality Quantification for the Enhancement of Combat Rations (Natick)

Resource sharing was an efficient and cost effective way to gain operational experience in several critical areas; pouch handling, pouch inspection, film formability and pouch filling.

3.7 Support to Industry (Section Reference #3.3.7)

MRE PAT Meetings: Meetings were held at DPSC to select a suitable replacement for Himont polypropylene, the critical interior laminate of the MRE (see Appendix 4.2). The committee approved Exxon XPP399.

Industry ad hoc meetings for HFFS: The MRE processors and DPSC met at CRAMTD on July 21, 1994 for a HFFS machine demonstration and discussion on potential equipment vendors. A two day meeting was held at DPSC on July 27-28, 1994 with six MRE suppliers, DPSC, Multivac, Tetra-Laval Foods and Rutgers to prepare specifications for quotations on six HFFS machines. These machines will be built to produce MRE based on equipment and film material developed at CRAMTD.

Laminate specifications and pouch forming information was given to Natick to assist in the release of the mil-spec revision.

4.0 Appendix

4.1 Projected Time & Events and Milestones

4.2 MRE Film Cross Section

4.3 Reynolds Film Specification

4.4 MRE Seal Strength Comparison

4.5 Results of Natick ASTM Handling Tests

4.6 Natick Specification Change to MIL-P-44073D for use of HFFS Pouches

4.7 Material Specifications

4.8 Memo: Test 3 Reynolds Samples

4.9 Test Results for Morprime, Morton and Lord Adhesive

4.10 Test Results of Valspar Adhesive

4.11 Pouch Forming Characteristics

4.12 Cartoner Selection Criteria and Specification

4.13 Cartoner Proposal Evaluation

4.14 Request for Subcontract of Cartoner and Econocorp Proposal

4.15 Memo: Qualification Run

4.16 Production Records for Ham Slice

4.17 Production Records for Beef Stew

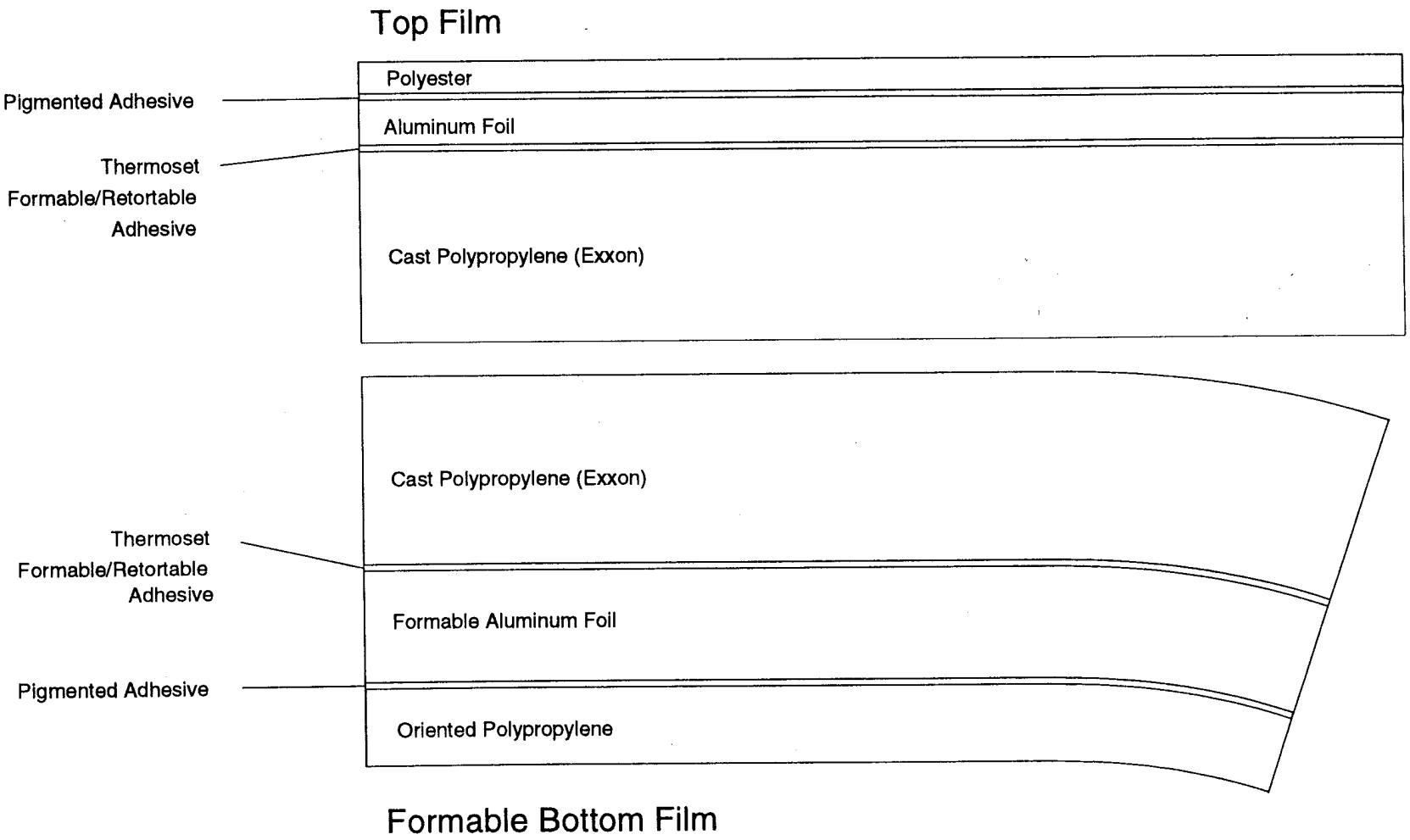
4.18 SMART System Operating Program

Figure 1 - CRAMTD Short Term Project #23
Pouch Qualification from Form/Fill/Seal Machine
Projected Time & Events and Milestones

Task Name	Reference	1993							1994											
		J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Establish Material Specification	3.3.1																			
Acceptance Testing & Inspection	3.3.2																			
Equipment Spec & Acquisition	3.3.3																			
Production Process Definition	3.3.4																			
Test Article Production	3.3.5																			
Coordination woth Other CRAMTD	3.3.6																			
Finished Article Testing (NRDEC)																				
Support to Industry	3.3.7																			
Final Report	3.3.8																			

Printed: 06/21/96

MRE Film Cross Section



REYNOLDS ALUMINUM
Reynolds Metals Company • Flexible Packaging Division • Technology Center
2101 Reymet Road • Richmond, Virginia 23237 • (804)281-2000

Neal Litman
CRAMDT
Rutgers University
120 New England Avenue
Piscataway, NJ 08854

June 28, 1994

Dear Neal:

Per your request, the following are descriptions of the materials we will be supplying to Rutgers later this year for your formable MRE program.

Top stock

0.48 mil polyester film-green adhesive-0.0007" aluminum foil-clear adhesive- 3.0 mil cast polypropylene film

Formable bottom stock

1.2 oriented polypropylene film-green adhesive-0.00175" aluminum foil- clear adhesive-3.0 mil cast polypropylene film

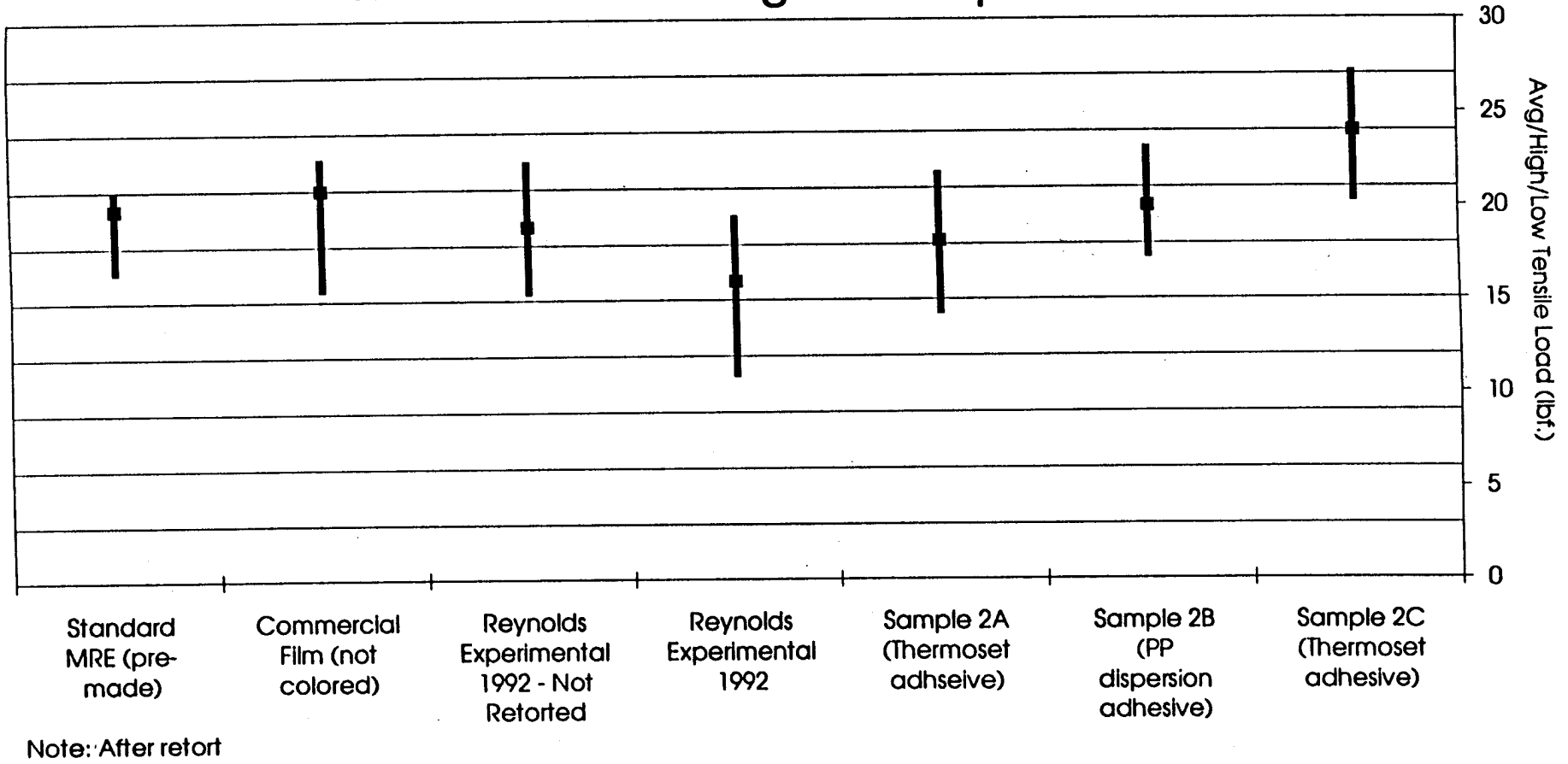
If you need anything further, please let me know.

Sincerely,

Jim Guida

CC: Jim Fry
Mary Speight
Joe Williams
Mike Carter

MRE Seal Strength Comparison



Note: After retort

ASTM HANDLING TESTS

- 21" DROP TEST - ASTM D 775-80
  Manufacturer's Joint corner drop
  3 radiating edges from Manufacturer's Joint
  6 Faces of the container

- VIBRATION TEST - ASTM D 999-75
  268 cycles per minute / 1 hr. duration

PLACEABLE / AMBIENT

- UNREMARKABLE
- 29% OF POUCHES EXHIBITED FLEX CRACKS ALONG RAISED RIDGE (T)
- FLEX CRACKS CONSIST OF
  Delaminations 0.5mm - 1.7mm (1.2mm avg)
  Foil Crack 0.3mm - 1.0mm (0.6mm avg)
- NO TEARS IN OPP OR PET

Samples # 56 + 115

PLACEABLE / -20 F

- 1 LEAKER (0.8%)
- 0.5% OF POUCHES EXHIBIT FLEX CRACKS ALONG RAISED RIDGE (T)
- FLEX CRACKS CONSIST OF
  Delaminations 0.9mm - 1.5mm (1mm avg)
  6 incidences
  Foil Cracks 0.3mm - 1.0mm (.6mm avg)
- LEAKER RATE COMPARES FAVORABLY WITH ARCHIVAL DATA (2-3% for placeables)

Sample #97

PUMPABLE / AMBIENT

- NO LEAKERS
- 8 HAVE TEARS THRU PET + FOIL
- 4 HAVE TEARS/ABRASIONS THRU PET
- 7 HAVE DELAMINATIONS
- NO TEARS THRU OPP

Samples # 40 + 66

PUMPABLE / -20

- 10 LEAKERS / ALL LIDSIDE 8.3%
- 2 - 2 LAYER PENETRATIONS (L)
- 1 TEAR THRU PET/FOIL
- 1 TEAR THRU OPP/FOIL
- 2 - DELAMINATIONS (T)
- LEAKER RATE COMPARES FAVORABLY WITH ARCHIVAL DATA (26-33% FOR PUMPABLES)

#'s 93,116,63,69,36

To: jsmith@dpsc.dla.mil,lmahoney@dpsc.dla.mil,
akoprivec@dpsc.dla.mil,hoffman,
<@Natick-EMH2.Army.Mil:hoffman@afsva5.afsv.af.mil>,
GLFS15%1fs%il@MQG-SMTP1.USMC.MIL,amiraulr@lee-emh2.army.mil,
arichard@Natick-EMH2.Army.Mil,psherman@Natick-EMH2.Army.Mil,
tlegleit@Na
From: "Tamara J. Legleiter" <tlegleit@Natick-EMH2.Army.Mil>
Cc:
Bcc:
Subject: Flexible Pouches
Attachment:
Date: 4/4/95 1:20 PM

Received: by natick-amed02.army.mil; Tue, 4 Apr 95 13:20:13 EDT
Date: Tue, 4 Apr 95 13:03:28 EDT
From: "Tamara J. Legleiter" <tlegleit@Natick-EMH2.Army.Mil>
To: jsmith@dpsc.dla.mil, lmahoney@dpsc.dla.mil,
akoprivec@dpsc.dla.mil,
hoffman <@Natick-EMH2.Army.Mil:hoffman@afsva5.afsv.af.mil>,
GLFS15%1fs%il@MQG-SMTP1.USMC.MIL, amiraulr@lee-emh2.army.mil,
arichard@Natick-EMH2.Army.Mil, psherman@Natick-EMH2.Army.Mil,
tlegleit@Natick-EMH2.Army.Mil, fdileo@Natick-EMH2.Army.Mil,
aaindex@Natick-EMH2.Army.Mil
Subject: Flexible Pouches

SATNC-WRE(Valvano/4259) 30 March 1995

TO: DPSC-HROAC(Gifford/2869)

Subject: Document Changes; MIL-P-44073D, Packaging and Thermoprocessing of Foods in Flexible Pouches; Use of Horizontal Form-Fill-Seal (HFFS) Pouches

The following changes are provided to the subject document for all current, pending, and future procurements until the document is formally amended or revised:

Paragraph 3.1.2.1, make the following changes:

a. In line 1, after "material" insert "for preformed flat style pouches".

b. At end, insert new requirements:

"Alternatively, the retort pouch may be a horizontal form-fill-seal (HFFS) pouch consisting of a formed tray-shaped body with a flat-sheet, heat sealable cover. The tray-shaped body shall be fabricated from a 3-ply laminate consisting of, from inside to outside, 0.003 to 0.004 inch thick polyolefin, 0.0015 to 0.00175 inch thick aluminum foil, and 0.0010 to 0.0014 inch thick oriented

polypropylene. The material for the formed, tray-shaped body shall conform to all previously stated requirements, except that the color may be applied to the adhesive layer between the aluminum foil layer and the oriented polypropylene. When formed into the tray-shaped body, the laminate shall not be stressed beyond its tensile limits. The flat sheet cover shall be made from the same material as specified for the preformed pouch."

Paragraph 3.1.2.2, make the following changes:

a. In line 2, after "figure 1" insert "or in horizontal form-fill-seal pouches".

b. At end, insert new requirements:

"The HFFS pouch dimensions shall be within the maximum allowable outside dimensions of the pouches specified by figure 1. The HFFS pouches shall be provided with tear notches in accordance with the details and locations as specified for preformed pouches in figure 1. Serrations are not permitted."

Paragraph 3.2, make the following changes:

a. In line 7, after "figure 1" insert:

"For HFFS pouches, the closure seal shall be a perimeter seal, minimum 3/16 inch wide and all four inside pouch corners shall be provided with a 3/8 inch radius."

b. In Table I, under the applicable headings, insert new requirements:

Characteristic	Requirement	Test	Lot size	Sample	Inspection
"Oriented polypropylene thickness 1/"	3.1.2.1	4.3.1.4	1 yard	1/2 yard	S-1

Paragraph 4.3.1, insert new material requirements:

"4.3.1.4 Oriented polypropylene thickness. The thickness shall be determined in accordance with L-P-378, except that a machinist's micrometer may be used provided that its graduations and accuracy conform to the requirements of L-P-378. The average thickness of the samples shall be reported to the nearest 0.0001 inch."

Gary W. Shults

Acting Chief, Ration Systems Division
Sustainability Directorate

ES REQUIRED

RValvano/4259
Acting C, ESB, RSD, SusD

CF:
Cmdt, USMC
Cdr, NFSSO
USDA, Mr. Roger L. Luttrell

AAINDEX
PSHERMAN
ARICHARD
BATWOOD
FDILEO
TLEGLEITER
AMIRAULR@LEE2-EMH2.ARMY.MIL
HOFFMAN@AFSVA5.AFSVA.AF.MIL
GLFS15%lfs%il@MQG-SMTP1.USMC.MIL
AKOPRIVEC@DPSC.DLA.MIL
LMAHONEY@DPSC.DLA.MIL
JSMITH@DPSC.DLA.MIL

COMBAT RATION ADVANCED MANUFACTURING TECHNOLOGY DEMONSTRATION

RAW MATERIAL SPECIFICATION

Revision Date: 1/30/93
Supersedes: New

Product: Green Bottom Web for HFFS
Raw Material ID Number: 34

General Description and Specifications :

The Green Bottom Web material for HFFS is an experimental 3-ply laminate retortable foil film. The material is described as Formable bottom stock, 1.2 oriented polypropylene film-green adhesive-0.00175 inch aluminum foil-clear adhesive-3.0 mil cast polypropylene film. The finished material should comply with all applicable regulations of the Food and Drug Adminstration covering food packaging materials

Packaging:

Packaged in polyethelene lined pallets

Storage:

Storage at ambient temperatures.

COMBAT RATION ADVANCED MANUFACTURING TECHNOLOGY DEMONSTRATION

RAW MATERIAL SPECIFICATION

Revision Date: 1/30/93
Supersedes: New

Product: Green Top Web for HFFS
Raw Material ID Number: 33

General Description and Specifications :

The Green Top Web material for HFFS is an experimental 3-ply laminate retortable foil film. The material is described as top stock, 0.48 mil polyester film-green adhesive-0.0007 inch aluminum foil-clear adhesive-3.0 mil cast polypropylene film. The finished material should comply with all applicable regulations of the Food and Drug Adminstration covering food packaging materials

Packaging:

Packaged in polyethelene lined pallets

Storage:

Storage at ambient temperatures.

COMBAT RATION ADVANCED MANUFACTURING TECHNOLOGY
DEMONSTRATION

RAW MATERIAL SPECIFICATION

==========

Revision Date: 8/10/94
Supersedes: New

Product: Cooked Ham, Water Added
Raw Material ID Number: 13 (Logs)
15 (Small Slice)
20 (Large Slice)

General Product and Process Description: The ham shall be the equivalent of an Institutional Meat Purchase Specifications (IMPS) No. 402B ham, except ham tying shall not be necessary, and all the shank meat shall be removed and excluded. The ham shall be of selection No. 2 with a weight range of 8 to 14 pounds and a maximum average fat thickness of 1/4 inch.

Raw ham, in the bone-in or boneless form, shall be received in the fresh-chilled or in the frozen state. Fresh-chilled ham shall not have been previously frozen. The fresh-chilled ham shall be held for not more than 4 days after initial chilling at a temperature not to exceed 40°F prior to preparation and further processing. The frozen ham shall be held for not more than 120 days after initial freezing at a temperature not to exceed 0°F prior to preparation and further processing.

The boned and trimmed ham shall be further trimmed, if necessary, to assure compliance with finished product requirements. The frozen ham shall be tempered/thawed to an internal temperature of 38° to 42°F prior to stuffing and forming.

The boned and trimmed ham shall be mechanically reduced in size to chunk-type pieces weighing at least 2 ounces.

The chunked ham pieces shall be mechanically cured and mixed with the following ingredients until the product becomes tacky.

Water
Salt
Dextrose
Hydrolyzed vegetable protein
Brown sugar
Corn syrup solids
sodium erythorbate
Sodium nitrite

Water used in the formula shall conform to the National Primary Drinking Water Regulations, and chemicals shall comply with the Food Chemical Codex.

The total amount of salt in the formula shall be adjusted, as necessary, to produce a product that complies with the finished product salt requirements. The sodium nitrite shall be of sufficient strength to assure a complete cure without exceeding 156 part per million (ppm) of nitrite in the cured ham during preparation.

The mixture shall be held prior to or after the stuffing operation at an internal temperature of 38° to 42°F for not less than 12 hours nor more than 72 hours before cooking, to assure uniform cure dispersion in the mixture.

The cured ham mixture shall be mechanically stuffed tightly into 4 by 6 by 12 inch stainless steel mold, and formed. The formed ham logs shall be cooked in a cook house or in water until the internal product temperature reaches 150° to 152°F.

The cooked ham logs shall be cooled to an internal temperature of 28° to 40°F within 24 hours following the cooking process and held not longer than 48 hours after removal from cooking process and prior to slicing. If the cooked ham logs are to be held longer than 48 hours after cooking or shipped as logs, they shall be mechanically stuffed and packaged (see packaging below).

Logs (ID# 13): The ham shall be packed as logs without any slicing.

Slicing: I. Small slices (ID# 15):

The ham logs shall be sliced into approximately 3 by 4 by 5/8 inches and packed immediately after slicing.

a. The thickness of slices shall be not less than 0.58 inches and no more than 0.72 inches with an average of not less than 5/8 (0.625) inches.

b. The weight of slices shall be not less than 140 g, and no more than 172 g, with an average of not less than 145 g.

II. Large slices (ID# 20):

The ham logs shall be sliced into approximately 6 by 4 by 5/8 inches and packed immediately after slicing.

a. The thickness of slices shall be not less than 0.58 inches and no more than 0.72 inches with an average of not less than 5/8 (0.625) inches.

b. The weight of slices shall be not less than 280 g, and no more than 350 g, with an average of not less than 310 g.

Packaging: The ham, slices or logs, shall be vacuum-sealed in a heat sealable, FDA and USDA food approved, casing materials, boxed and labeled appropriately.

Storage: The packed ham, slices or logs, shall be maintained under refrigeration at an internal temperature of 28° to 40°F for a period of not more than 30 days.

COMBAT RATION ADVANCED MANUFACTURING TECHNOLOGY DEMONSTRATION

RAW MATERIAL SPECIFICATION

==========

Revision Date: 3/20/94
Supersedes: New

Product: Reformed Beef Cubes
Raw Material ID Number: 19

The same description and characteristics of reformed beef cubes (material ID # 1) **except** the dices dimensions, which should be as follows:

Width:	1/2"
Thickness:	1/2"
Length:	1/2"

COMBAT RATION ADVANCED MANUFACTURING TECHNOLOGY
DEMONSTRATION

RAW MATERIAL SPECIFICATION

==========

Revision Date: 3/18/93
Supersedes: 12/10/92

Product: Reformed Beef Cubes
Raw Material ID Number: 1

General Product and Process Description:

The beef shall be from steers, heifers, or cows and shall be derived from any combination or portion of recognizable primal rounds (shank off, heel out, and knuckles, peeled) or subprimal cuts of the round, shank off (top round, bottom round, heel out, and knuckles, peeled). Recognizable cuts are those which, when compared to Institutional Meat Purchase Specifications (IMPS) cuts, have no more than minor amount of lean, fat, or bone removed or included from an adjacent cut. A portion is a certified recognizable cut from which objectionable tissue, such as tendons or heavy connective tissue, has been removed. The beef shall be in the fresh-chilled state and shall be in excellent condition, i.e. exposed lean and fat surfaces shall be of a color and bloom normally associated with the class and cut of meat and typical of meat which has been properly stored and handled. Cut surfaces and naturally exposed lean surfaces shall show no more than slight darkening or discoloration due to dehydration, aging, or microbial activity. The fat shall show no more than slight discoloration due to oxidation or microbial activity. No odors foreign to fresh meat shall be present. Changes in color and odor characteristically associated with vacuum-packaged meat in excellent condition shall be acceptable. Also, meat shall show no evidence of freezing, defrosting, or mishandling.

The beef shall be mechanically coarse ground in a Hobart Grinder Mixer and through a Hobart Plate number 560K PM having kidney-shaped openings measuring not less than 1.25 inches in the shortest dimension. The grinder shall be equipped with a two-blade knife. The beef logs shall be formulated, prepared, and processed as follows:

Ingredient	Percent by weight
Beef	95.75
Ice or ice water	3.00
Salt	1.00
Sodium tripolyphosphate	0.25

A. The coarse ground (chunked) beef shall be mechanically vacuum mixed with the salt and sodium tripolyphosphate. The mixing shall continue until the mixture exhibits a sticky (tacky) consistency. Time from grinding to mixing shall not exceed 4 hours. Temperature of the meat mixture shall not exceed 40 F during this 4 hour period.

B. The mixed meat shall immediately be mechnically tightly stuffed into casings of a size to accomodate the finished product meat dimension requirement. The stuffed beef logs shall be in the cooking process within 24 hours after being stuffed. The temperature of the logs shall be maintained at an internal temperature of 28 to 40 F during this 24 hour period.

C. The logs shall be cooked in a cookhouse (smokehouse without smoke) or by other commercially acceptable cook methods to a minimal USDA approved center line temperature.
D. Immediately after completion of the cooking process, the cooked beef logs shall be placed in an ice water bath or other commercially acceptable rapid cooling method. The cooled logs shall be held for not more than 48 hours at an internal temperature of 28 to 40 F prior to dicing.

E. The cooked beef logs shall be mechanically diced to yield uniform dices of approximately 5/8 by 5/8 by 5/8 inches. The beef dices shall be screened for elimination of fines. The dices shall be held not longer than 48 hours at an internal temperature of 28 to 40 F until packaged and vacuum sealed (see F.).

F. Dices shall be packed and vacuum sealed in water-impermeable material having an oxygen permeability rate of not more than 10 cc of oxygen per square meter per 24 hours at 73 F and 0 percent relative humidity and shall be frozen to an internal temperature of 0 F or below within 72 hours. The initial freezing (in-storage) date and processing and packaging requirements shall be certified by a USDA Agricultural Marketing Service (AMS) Livestock Division Agent. The packaged, frozen dices shall have been held at an internal temperature of 0 F or below for a period not to exceed 6 months prior to pouch filling.

Note: The above general description of reformed beef cubes and it's process are based on MIL-B-44059C (5 OCT 1988)

Specifications:

1. Grade & Cut

USDA Utility grade beef, minimum 85% lean, knuckles

2. Cook Conditions

Product should be cooked to a yield of 80 to 85%

3. Diced Dimension:

Width:	5/8"
Thickness:	5/8"
Length:	5/8"

4. Uniformity:

Not more than 50% by weight of the cubes should be smaller than 1/2" in any dimension.
No cube should be bigger than 7/8" in any dimension

5. Fines:

Natural fall from dicer permitted.
No more than 10% through a #4 screen

6. Fat content:

15% maximum

7. Cartilage, coarse tissue, tendons, ligments, grandular material:

10% maximum

8. Bone pieces:

No bone pieces measuring 0.3 inch or more in any dimension

Microbiological Standards:

SPC:	n=5	c=2	$m=5*10^5$	$M=10^7$
E. coli	n=5	c=2	m=11	M=500
S. aureus	n=5	c=1	$m=10^3$	$M=10^4$

Where n is the number of samples taken and M is the upper limit. No counts which exceed M are allowed, and only up to "c" number of samples with counts greater than "m" are allowed.

Labeling:

Each box should be labeled according to USDA regulations and should identify weight and production day codes. Effective and proven "Trace and Recall" program must be in place.

Packaging:

Cooked, frozen beef dices shall be packed and vacuum sealed in water-impermeable material having an oxygen permeability rate of not more than 10 cc of oxygen per square meter per 24 hours at 73 °F and 0 percent relative humidity and shall be frozen to an internal temperature of 0 °F or below within 72 hours.

Each bag should contain approximately 20 lbs of precooked diced beef and be packed in boxes. Maximum weight per box is 40 lbs. No metal, rubber, string or rope may be used to fasten the flaps or lids. Approved adhesive or freezer-type tae may be used. All boxes must be new, clean and stackable with well sealed flaps or lids.

Storage:

The packaged, frozen, cooked beef dices shall have been held at an internal temperature of 0 °F or below for a period not to exceed 6 months prior to pouch filling.

THE STATE UNIVERSITY OF NEW JERSEY

RUTGERS

Interdepartmental Communication

To: Kit Yam
Neal Litman

From: Ted Descovich TD

Date: March 31, 1993

Subject: STP #23 - Pouch Qualification
Establish Material Specification - Section 3.3.1

This memo documents the results of our meeting on 3/26/93 on the procedures and tests to be used to select the proper foil laminate material from the three Reynolds pilot plant samples.

The foil laminate samples will be sealed on the Tiromat with no forming and tested for seal strength. The following tests will be made before and after retorting.

1. Existing top material sealed to top material.
2. Pre-made pouches, compare results with test #1.
3. Reynolds three samples compared with standard top film used in test #1.
4. Compare Tiromat sealing with bench top sealing (to check for any testing variations caused by the seal rubber configuration).

Fifteen samples of each of the above will be tested on the Instron. One hundred samples of each test will be tested by manual peeling.

Three sided sealed samples will be sent to Reynolds for evaluation and testing on their Hydrostatic Pouch Burst Tester.

Samples of the foil laminated material that failed in the production runs in August 1992 will be retested.

The results of these tests will be complied in a report and will be reviewed jointly by Reynolds and Rutgers before specifying which film sample to use for the production material.

cc: J. Coburn
A. Sigethy
J. Guida (Reynolds)

To : Dr. K. Yam, Neal Litman, Ted Descovich

From : Edwin Ho and Angel Ng

Date : August 3, 1993

Re: Report for pouch qualification STP #23

CONCLUSION AND RECOMMENDATION

The Instron tensile peel test and the internal pressure burst test were used to compare the performance of Lord, Morprime, and Morton as adhesive. The seal formed with the Morton film and the standard MRE film has a tensile seal strength of 24.5 lb_f/in, which exceeds the 12 - 15 lb_f/in generally considered to be adequate for MRE pouches. Compared to the seals formed using the Lord and the Morprime films, those formed with the Morton film are more consistent in stress-strain behavior and are more tolerant to location changes and retorting. The results of the internal pressure burst test are consistent with those of the tensile peel test, showing that the Morton film has the highest burst strength. Visual examination shows that failures of the Morton/standard MRE seal (Morton as bottom film and standard MRE as the top film) are attributed mostly to the MRE film and not to the Morton film. Compared to the ~~Vespak~~ Valspar film that was used for the first qualification run in August 1992, the seal strength using the Morton film is 60% higher in seal strength. Because of its demonstrated superior performance, the Morton film is recommended for production and qualification testing and also for use as the adhesive to replace Morprime in the top film.

OVERALL OBJECTIVE

To determine the best adhesive—among Lord, Morprime and Morton—to be used for production and qualification testing.

SUB-OBJECTIVES AND SPECIFIC TASKS

1. To use the tensile peel test and the internal pressure burst test to determine and compare the seal characteristics of Lord (film 2A), Morprime (film 2B), and Morton (film 2C)

   a. before and after retorting

   b. as a function of three pouch locations (see Diagram 1a)

   c. as a function of failure mode

   Films 2A, 2B, 2C are used as the bottom film, and the standard nonformable MRE film is used as the top film.

2. To determine and compare the seals

   a. formed using the Tiromat heat sealer (the seal denoted 1A in Diagram 1b)

   b. formed using the Reynold heat sealer (the seal denoted 1B in Diagram 1b)

   a. formed using the heat sealer of a vendor (the seal denoted 1C in Diagram 1b)

   The above seals are formed using the standard MRE film as both the top and the bottom films.

3. To compare the seal strengths of the Lord, Morprime, and Morton films to those of the Vespak film produced in the first film qualification run in August 1992.

MATERIALS AND METHODS

Materials

Three type of films were produced at the Reynolds' pilot plant using Lord, Morton, and Morprime adhesives. The structures of the fim are shown in Diagram 2. The samples are identified as follows.

1A : closure seal of standard MRE pouch from Tiromat

1B : Standard MRE (pre-made) pouch

1C : closure seal of standard MRE pouch from a co-packer

2A : Lord adhesive

2B : Morprime adhesive

2C : Morton adhesive

Top film : standard MRE film (non-formable)

Ham pouches : Reynold film with Lord adhesive from failed lot

Methods

(a) Instron tensile peel test

An Instron Universal Testing Machine with a 5 kN load cell and a data acquisition system.

Sample dimension: 2 in x 1 in (length x width)

Testing conditions:

crosshead speed (mm/min): 254

gauge length (mm): 508

Response parameters measured:

1. load-at-peak (lb_f)
2. % strain at peak (%)
3. % strain at break (%)

Sample size : refer to Table 1

(b) Burst test

Formed Pouch (by hand)

Sealed on Tiromat

Retorted, 45 min. at 255°F

Burst tester plate separation = 0.75 inches (1.9 cm)

RESULTS AND DISCUSSION

Task 1

1. Figure 1 shows that film 2C yields the highest seal strength. The load-at-peak for film 2C is 24.5 pound force (lb_f), which is 20 - 25% higher than those of films 2A (19 lb_f) and 2B (20 lb_f). Since the width of the test specimen is 1 inch, the seal strength (defined as load/width) may be obtained simply by dividing the load-at-peak by 1 inch. For film 2C the seal strength is 24.5 lb_f/in, which exceeds the 12 - 15 lb_f/in that is generally considered to be acceptable for MRE pouches.

2. Figure 1 also shows that the load-at-peak values for films 2A and 2C are slightly lower (significant at $p = 0.01$) after retorting. However the reductions are less than 10%.

3. Figure 2 shows that film 2C yield the most consistent seals. The variations in strain-at-peak and strain-at-break for film 2C are significantly less than those of films 2A and 2B, especially after retorting.

4. Figures 3 through 8 shows the effects of location on the seal characteristics. The locations (1, 2, and 3) are described in Diagram 1a. The data show that the seals using film C are least affected by pouch location and retort abuse.

5. Table 2 shows the failure modes of the samples. For the Morton samples (2C1 to 2CC3), a large portion of the aluminum layer in the top MRE film are broken, while all the aluminum layers in the bottom Morton layer are intact. Therefore failures of the Morton samples are attributed mostly to the top film, and not to the Morton film.

6. Table 3 shows the results of the internal pressure burst pressure. The Morton film has the highest mean burst strength and the lowest standard deviation. The results are

consistent with the seal strength data from the tensile peel test, both showing that Morton is the best film. The burst test also shows that the failure of the Morton samples is in the top film

Task 2

1. Figure 9 shows that the seals (sample 2C) formed using the Morton film and the Tiromat are stronger than those of the Reynolds preform seals and the closure seal of a vendor. However the seals formed by the Tiromat have more variations.

Task 3

1. Figure 10 shows the seal strengths of the ~~Vespak~~ Valspar pouches that were produced in the first qualification run in August 1992. The ~~Vespak~~ pouches contain ham slices. The average seal strengths at four locations of the ~~Vespak~~ pouches were measured to be 15.6 lb_f/in, which is 60 % lower than that of of the Morton film (25 lb_f/in).

Table 1 : Sample sizes used in different tasks

Task 1:

	Before retort			After retort		
Location / Sample type	**1**	**2**	**3**	**1**	**2**	**3**
2A	40	43	45	40	47	42
2B	50	50	41	35	51	29
2C	48	46	42	40	47	44

Task 2:

Sample type / Treatment	Before retort	After retort
1A	9	18
1B	11	20
1C	N/A	5

Abbreviation : N/A = not available

Task 3:

Location/Treatment	After retort
H1	8
H2	19
H3	10
H4	10

Table 2. Summarized result of failure mode examination (expressed as the proportion in % of sample identified to be broken at different layers)

Task 1:

Sample	Top Aluminum	Top Adhesive	Top/Bottom PP	Bottom Adhesive
2A1	28	0	100	60
2A2	9	0	100	91
2A3	9	0	100	56
2AA1	5	0	100	75
2AA2	0	0	100	81
2AA3	0	0	100	7
2B1	96	22	96	2
2B2	10	0	100	100
2B3	7	0	100	12
2BB1	80	0	100	11
2BB2	10	0	100	100
2BB3	7	0	100	24
2C1	88	0	100	8
2C2	46	0	100	70
2C3	31	0	100	50
2CC1	98	0	100	5
2CC2	100	0	100	0
2CC3	100	0	100	32

Illustrated abbreviation: 2A1 represents the sample 2A cut from the location 1 of the pouch **before** retorting

2AA1 represents the sample 2A cut from the location 1 of the pouch **after** retorting

Task 2:

Sample	Top/Bottom Aluminum	Top/Bottom PP	Top/Bottom Adhesive
1A	100	100	0
1AA	72	100	44
1B	100	100	73
1BB	100	100	85
1CC	100	100	60

Illustrated abbreviation: 1A represents the sample 1A (see Diagram 1b) **before** retorting

1AA represents the sample 1A (see Diagram 1b) **after** retorting

1CC represents the sample 1C (see Diagram 1c) **after** retorting

Task 3:

Sample	Top Aluminum	Top Adhesive	Top/Bottom PP	Bottom Adhesive
HAM1	13	0	100	100
HAM2	0	11	100	100
HAM3	0	0	100	100
HAM4	10	30	100	100

Illustrated abbreviation : HAM1 represents the sample cut from the ham slice package at location 1 (see Diagram 1d)

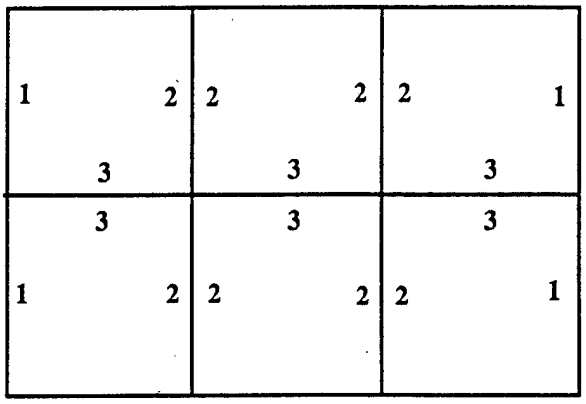
Table 3 : Result of intrenal pressure/burst test (expressed as burst pressure in psi)

sample	Burst pressure (psi) *	Description
Lord 2A	36	delamination top and bottom
	31	delamination top and bottom
	35	delamination top and bottom
	29	delamination top and bottom
	33	delamination top and bottom
	34	delamination top and bottom
	31	delamination top and bottom
	33	delamination top and bottom
	33	delamination top and bottom
	28	delamination top and bottom
mean	**32.3**	
standard deviation	**2.5**	
Morpime 2B	37	delamination top and bottom
	36	delamination top and bottom
	32	top film
	29	top film
	34	top film
	28	top film
	N/A	top film leak (25 psi)
	N/A	top film leak (31 psi)
mean	**32.7**	
standard deviation	**3.7**	
Morton 2C	34	top film
	40	top film
	37	top film
	42	top film
	37	top film
	40	top film
	37	top film
	40	top film leak, seal creep
	40	top film leak, seal creep
	40	top film leak, seal creep
mean	**38.7**	
standard deviation	**2.4**	

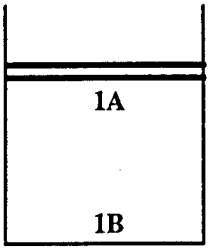
* minimum requirement : hold 20 psi for 30 sec without burst.

Diagram 1: Testing locations of different samples

a) Testing locations of 2A, 2B and 2C samples (before and after retort)



b) Testing locations of 1A and 1B (before and after retort)



c) Testing location of 1C of beef stew package (after retort)

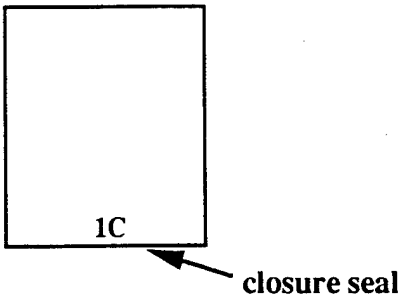


Diagram 1 : (continued)

d) Testing locations of ham slice package (retort treatment—not known)

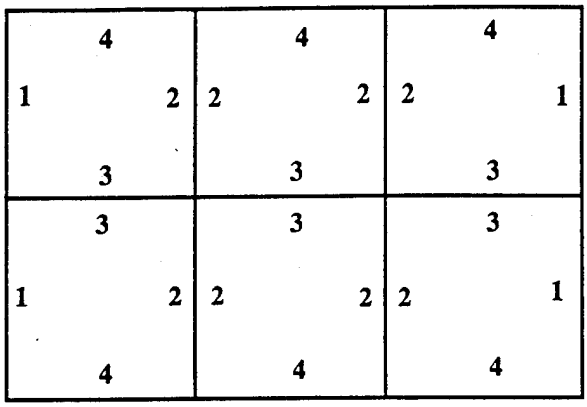


Diagram 2: MRE Film Structure

Reynolds Experimental Formable Foil Film

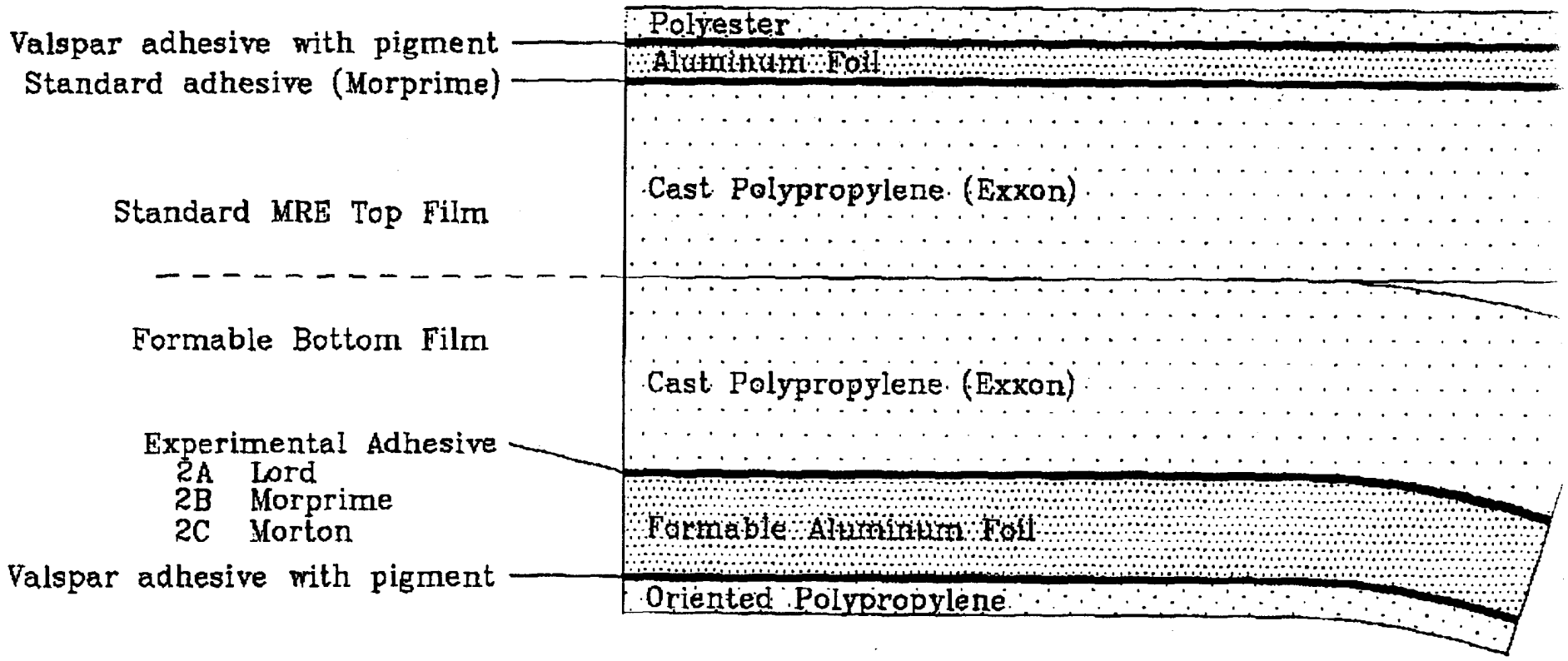


Figure 1. Effect of "retorting" on load at peak of different films (+/-SD)

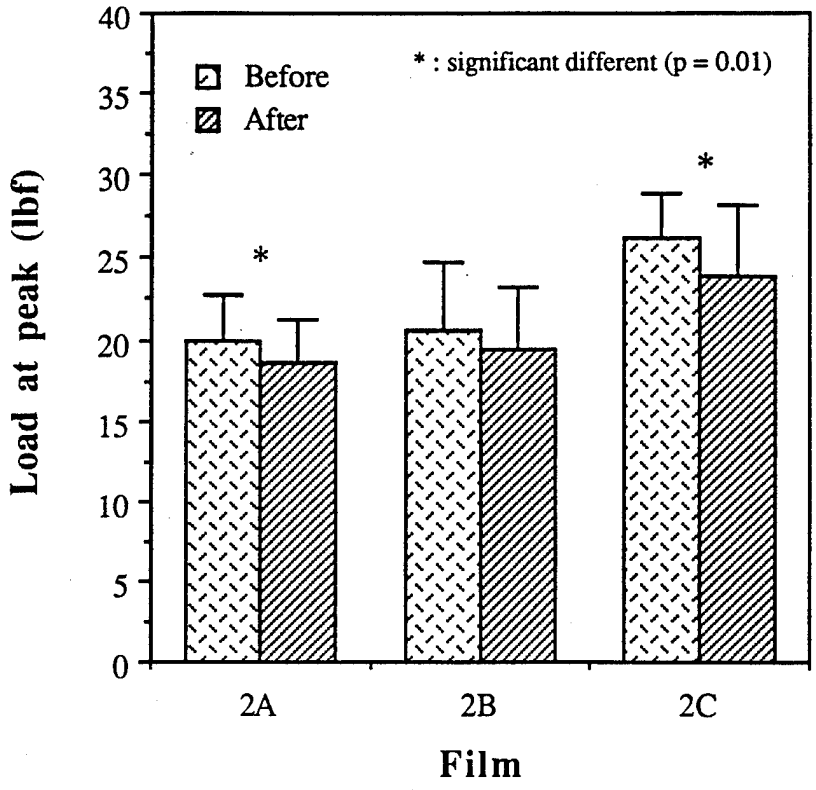


Figure 2. Comparison of % strain at peak (SNAP) and % strain at break (SNAB) ("before" and "after" retorting)

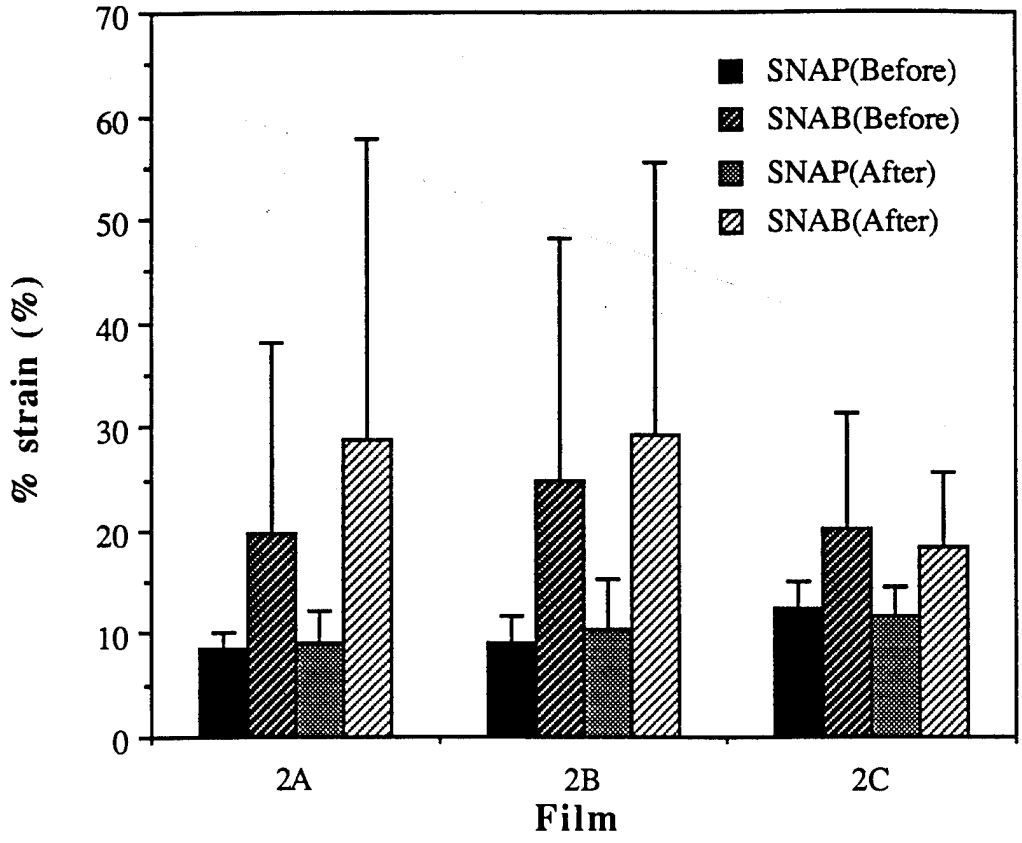


Figure 3. Load at peak at various locations of different films (before "retorting")

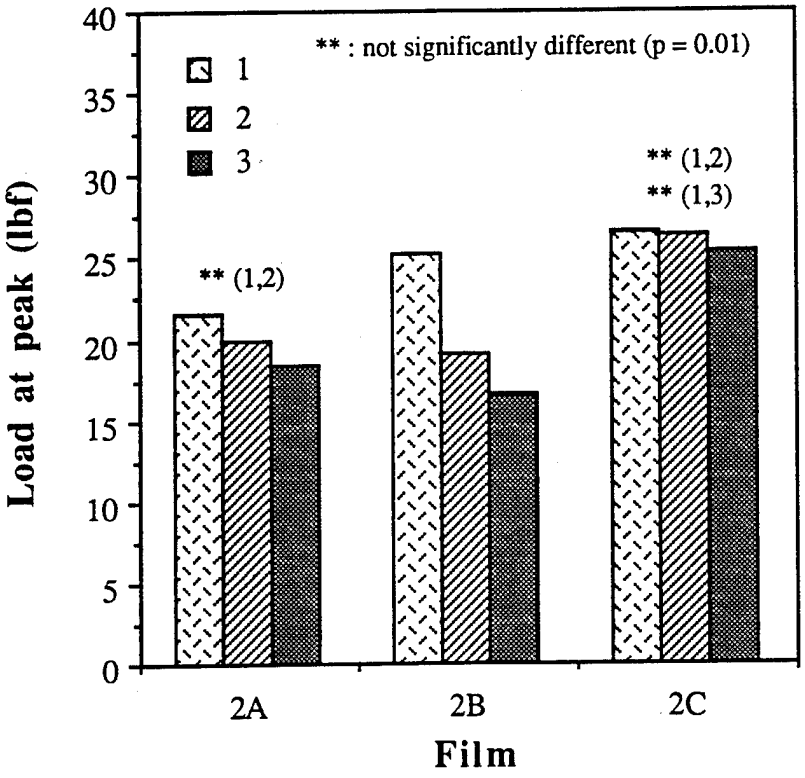


Figure 4. Load at peak at various locations of different films (after "retorting")

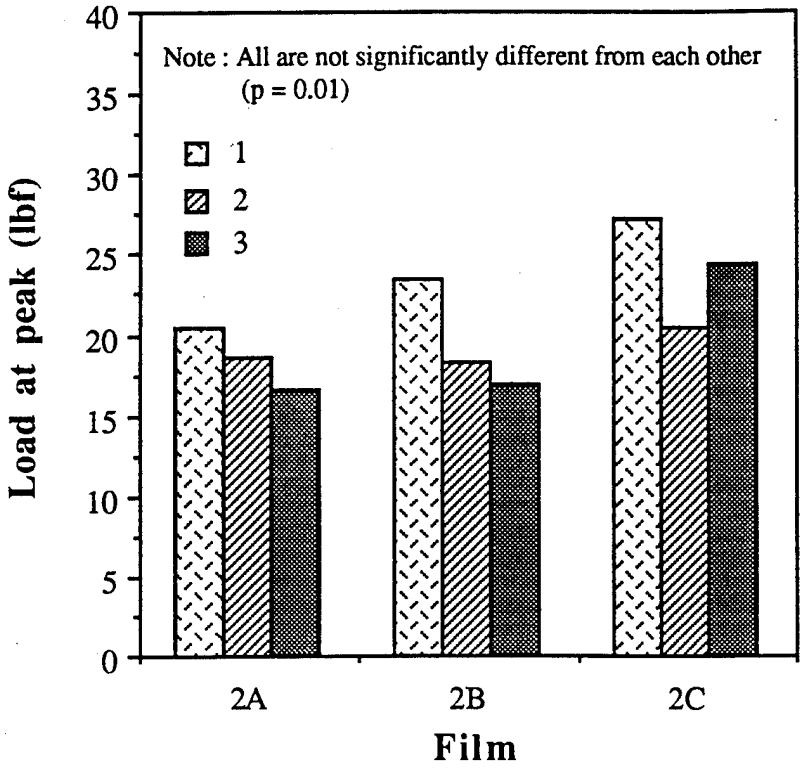


Figure 5. % strain at peak at various locations of different films (before "retorting")

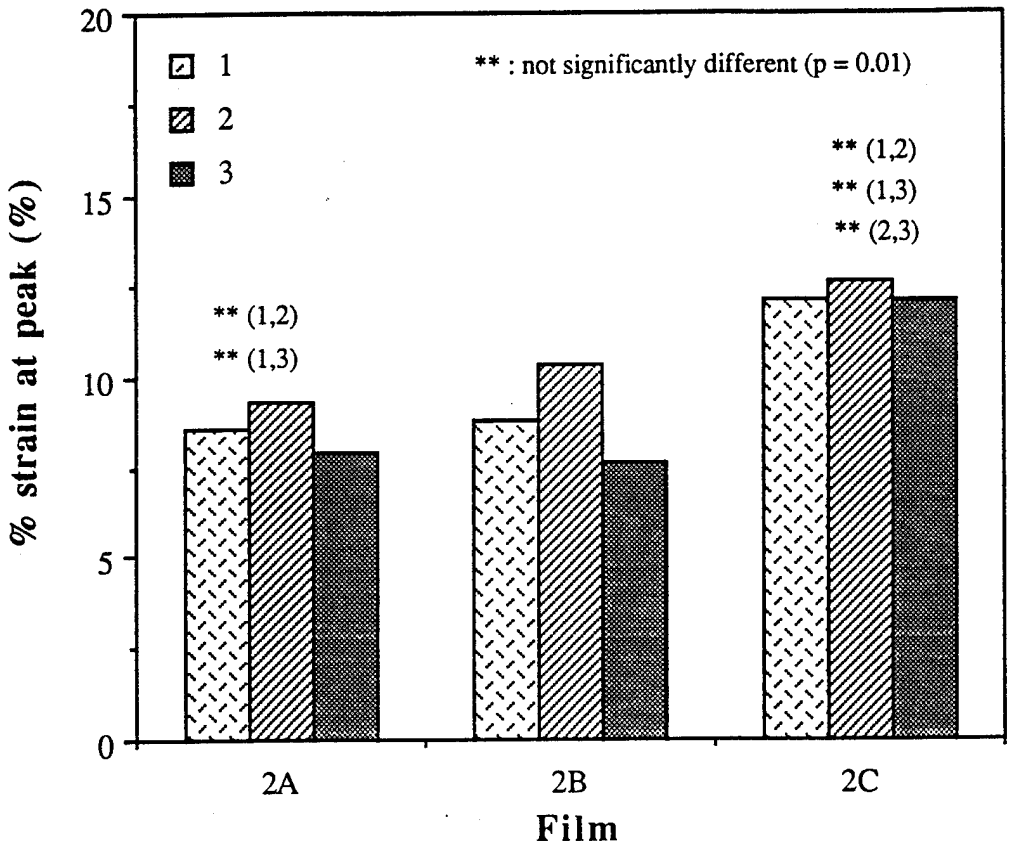


Figure 6. % strain at peak at various locations of different films (after "retorting")

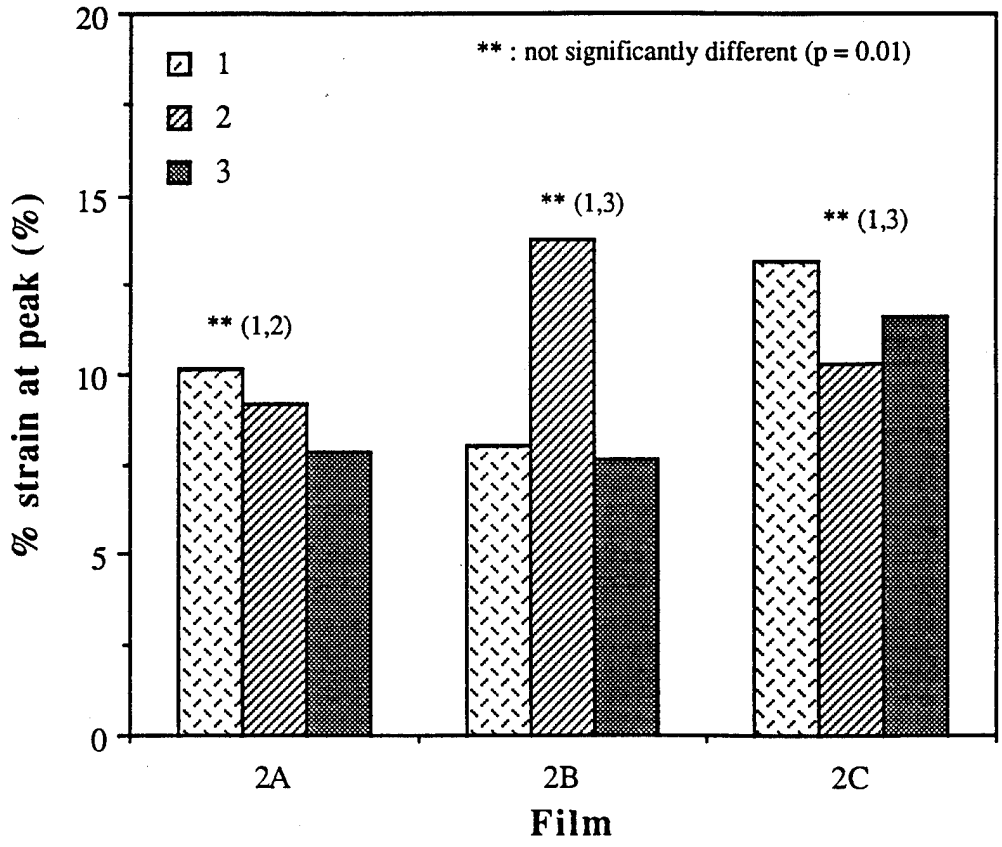


Figure 7. % strain at break at various locations of different films (before "retorting")

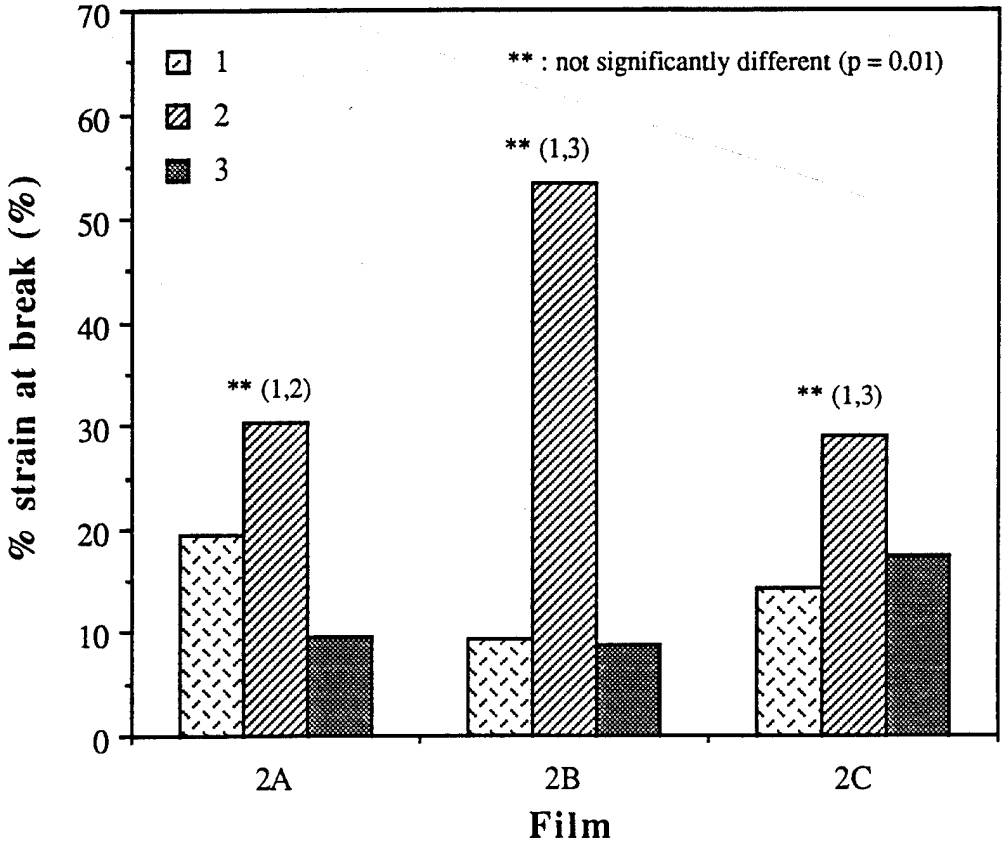
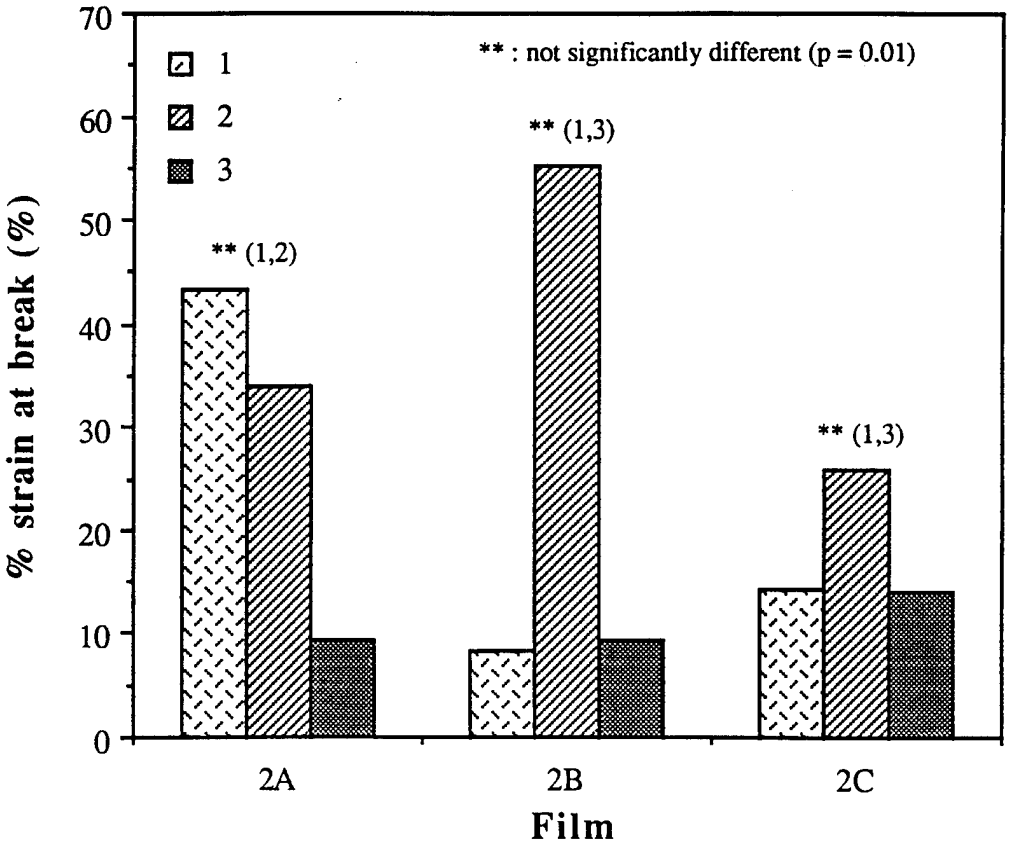
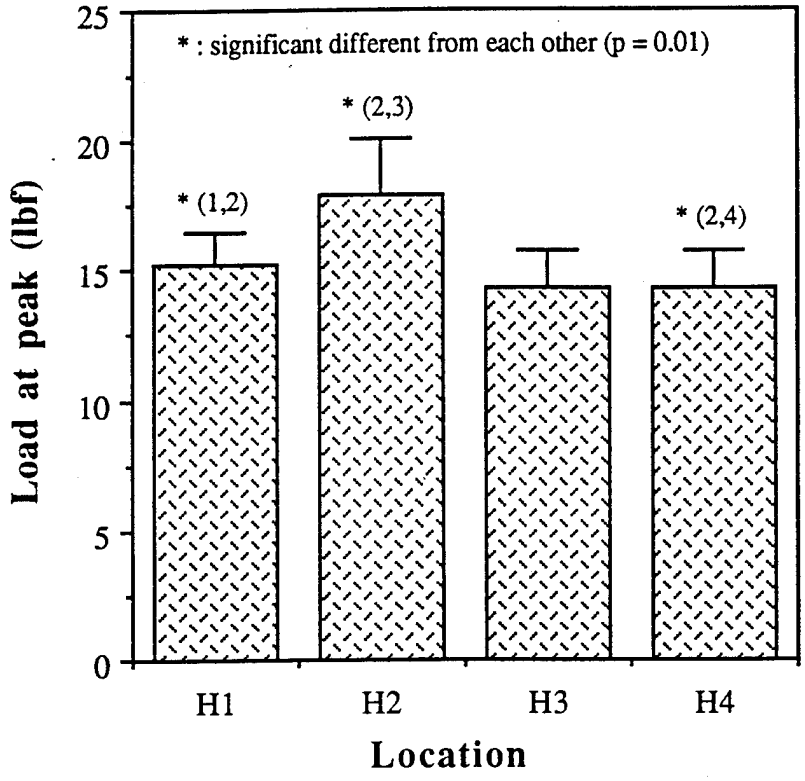


Figure 8. % strain at break at various locations of diffferent films (after "retorting")



Combine with Fig 9

Figure 10. Comparison of load at peak of ham package at different locations (+/-SD)



The Valspar Corporation

Packaging Coatings Group
2000 Westhall Street/Pittsburgh, PA 15233
412/766-9300
FAX 412/766-5835
TELEX 240824

July 14, 1994

Neal Litman
Food Manufacturing
Technology Facility
Rutgers, The State University
Of New Jersey

Dear Neal,

Further testing of the laminations made with the 815X330 adhesive and 94X023 hardener from the pilot line run on May 13th, at Reynolds Metals, has been completed. The testing was done on the substrate coated using the 815X330/94X023 system, in a 100 to 5 mix ratio. I feel from previous testing that this is the optimum mix ratio for this application.

In this round of tests, the air pressure used in making the draw was varied, as well as the depth of the draw. The results are as follows:

Sample #	**Depth of draw (cm)**	**Air Pressure (psi)**	**Observations**
1	3	20	No delamination or discoloration
2	3	45	No delamination, slight discoloration
3	3	90	No delamination, slight discoloration
4	1.5	20	No delamination or discoloration
5	1.5	45	No delamination or discoloration
6	1.5	90	No delamination or discoloration

The samples were all aged and processed in the same way. The deep draw when formed above 20 psi is giving some discoloration, however none of the other samples tested exhibited this characteristic. Based on these results, I feel very comfortable proceeding with the next step towards qualification of this adhesive system.

If you have any questions, please feel free to call me at (412) 734-8629.

Sincerely,

Fred Tady

Fred Tady

The Valspar Corporation

Packaging Coatings Group
2000 Westhall Street/Pittsburgh, PA 15233
412/766-9300
FAX 412/766-5835
TELEX 240824

July 14, 1994

Neal Litman
Food Manufacturing
Technology Facility
Rutgers, The State University
Of New Jersey

Dear Neal,

Evaluations on substrate coated on May 13, 1994 on the pilot line at the Richmond facility were tested using the draw die from Rutgers. Conditions of the trial and the results are as follows:

Run #	**Adhesive**	**Thinner**	**Mix Ratio**	**Film wt. mg/in^2**	**Catalyst**
1	815X330	Ethyl Acetate	100-5.5	4.65	910X418
2	815X330	90/10 EA/MPK*	100-5.0	7.00	94X023
3	815X330	90/10 EA/MPK*	100-7.0	3.80	94X023
4	815X330	50/50 EA/NPA*	100-5.5	5.25	910X418

The order of the runs were: 1, 4, 2, 3.

Machine Speed	100 ft/min
Temperature of Roller	250-260F
Oven Temperature	220F
Nip Pressure	65 PSI

*EA = Ethyl Acetate
*MPK = Methyl Propyl Ketone
*NPA = n- Propyl Acetate

Film Draw Test — Date Formed: 9-1-94

New Reynolds — Date Retorted: 9-2-94

Experiment	Forming Time	Tooling	Forming Pressure	Pouch Depth in.	Flat Area w x l in.	Volume cc
3	1.0	no insert	8 psi	0.63	*	170
4	2.0	no insert	8 psi	0.75	*	220
5	1.0	plates 3/4" depth	8 psi	0.62	*	185
6	2.0	plates 3/4" depth	8 psi	0.71	*	190
7	1.0	plates 5/8" depth	8 psi	0.63	*	180
8	2.0	plates 5/8" depth	8 psi	0.62	*	190
9	1.0	plates 1/2" depth	8 psi	0.51	3.5 x .75	180
10	2.0	plates 1/2" depth	8 psi	0.55	4.5 x 1.125	190
13	1.0	no insert	11 psi	0.68	*	200
14	2.0	no insert	11 psi	0.97	*	290
15	1.0	plates 3/4" depth	11 psi	0.71	*	210
16	2.0	plates 3/4" depth	11 psi	0.73	*	240
17	1.0	plates 5/8" depth	11 psi	0.65	2.75 x .75	200
18	2.0	plates 5/8" depth	11 psi	0.65	3 x .75	210
19	1.0	plates 1/2" depth	11 psi	0.52	4 x 1.125	190
20	2.0	plates 1/2" depth	11 psi	0.55	4.75 x 1.5	200
23	1.0	no insert	15 psi	0.95	*	270
24	2.0	no insert	15 psi	rupture	*	350
25	1.0	plates 3/4" depth	15 psi	0.79	*	250
26	2.0	plates 3/4" depth	15 psi	0.77	*	250
27	1.0	plates 5/8" depth	15 psi	0.66	4 x 1.25	230
28	2.0	plates 5/8" depth	15 psi	0.67	4 x 1.125	240
29	1.0	plates 1/2" depth	15 psi	0.55	4.5 x 1.5	210
30	2.0	plates 1/2" depth	15 psi	0.55	4.875 x 2	220
33	1.0	no insert	18 psi	1.25	*	330
34	2.0	no insert	18 psi	rupture		
35	1.0	plates 3/4" depth	18 psi	0.79	*	270
36	2.0	plates 3/4" depth	18 psi	0.79	*	280
37	1.0	plates 5/8" depth	18 psi	0.67	4.5 x 1.375	230
38	2.0	plates 5/8" depth	18 psi	0.67	4 x 1.375	250
39	1.0	plates 1/2" depth	18 psi	0.54	5 x 1.75	210
40	2.0	plates 1/2" depth	18 psi	0.54	5 x 2	220
41	1.0	no insert	0 psi	0.00		0
42	1.0	no insert	25 psi	rupture		

NOTES : NO FLAT *

Approximately 100 yds of substrate was coated for each run. The rolls were placed in a 140°F oven for five days and shipped to Pittsburgh for draw and retort testing. Samples of each run were cut and placed in the draw forming device and formed using 40 PSI air pressure. The drawn samples were placed in a pressure cooker for 1 hour at 240°F. Three samples of each run were tested. The results of the draw retort tests are as follows:

Run #	Sample #	Observations
1	1, 2, 3	Delamination and discoloration after draw and retort.
2	1, 2, 3	Very slight discoloration after draw and retort.
3	1, 2, 3	Slight discoloration after draw and retort
4	1, 2, 3	Delamination after draw and retort.

Other tests to be conducted include varying the severity of the draw and measuring the extent of deformation of the laminated structure, as well as varying the air pressure of the forming device.

If you have any questions please feel free to call at (412) 734-8629.

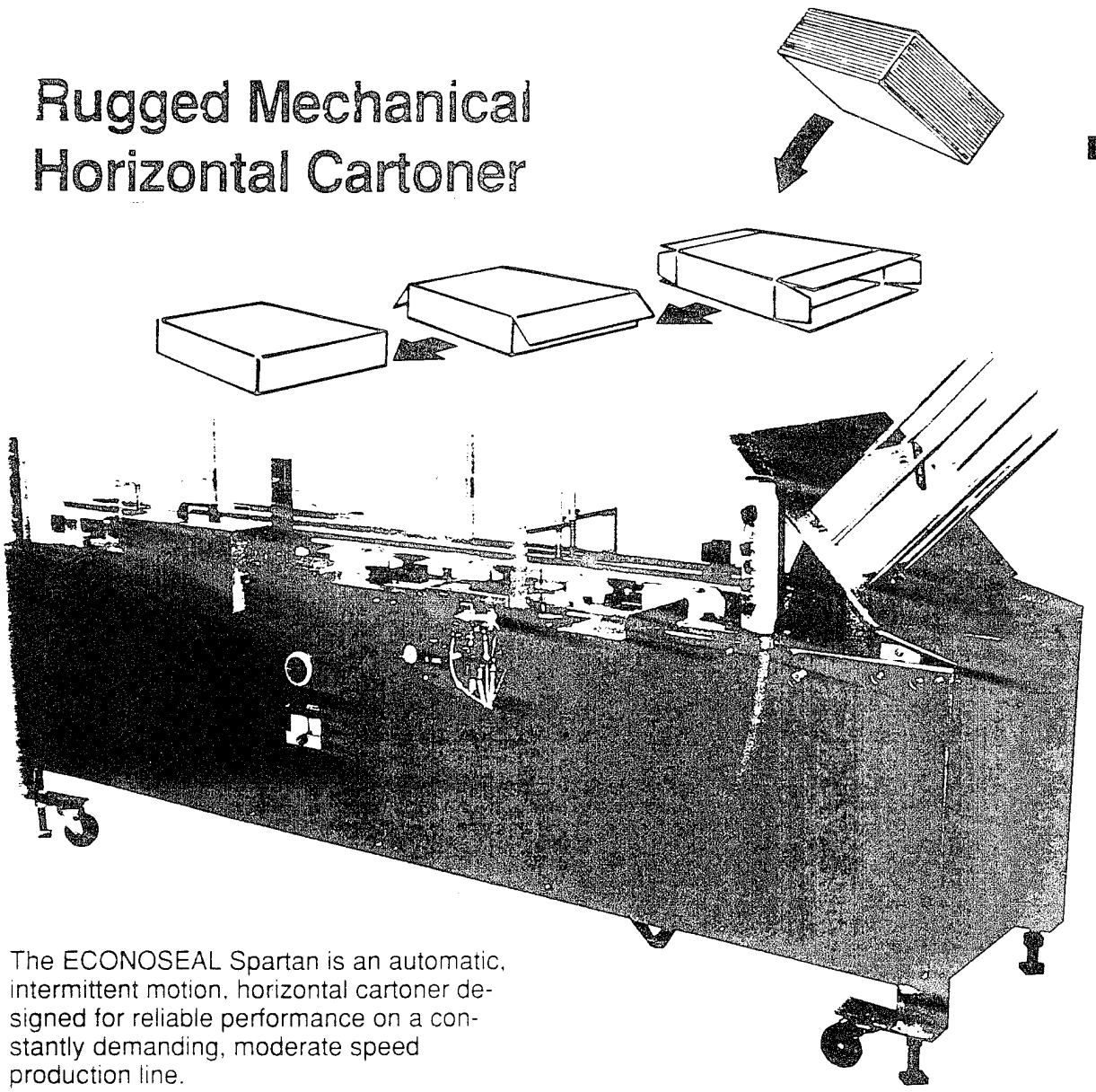
Sincerely,

Fred Tady

Fred Tady

Rugged Mechanical Horizontal Cartoner

Spartan Cartoner



The ECONOSEAL Spartan is an automatic, intermittent motion, horizontal cartoner designed for reliable performance on a constantly demanding, moderate speed production line.

Standard machine features include:

- **Sanitary construction — essentially stainless steel.**
- **Unitized, welded, caster mounted frame of heavy duty construction.**
- **3/4HP drive motor — "front wheel" drive system.**
- **Double chain and flight arrangement (including automatic chain tensioners) for improved carton squareness.**
- **Lateral hand wheel adjustment and replacement magazines for quick carton size changeovers.**
- **Lexan upper surface guarding.**
- **Internally mounted electrical cabinet — reduces floor space requirements.**

Method of Operation

In the Spartan, cartons are automatically erected from a supply magazine with vacuum cups and transported to the loading station. Product is then manually or automatically loaded into the carton and the loaded carton is advanced through a series of stations to accomplish secure closure (either by sealing or tuck closure) at both ends of the package.

MEMBER PMMI USA

ECONOSEAL®

ECONOCORP INC
72 PACELLA PARK DRIVE / RANDOLPH, MA 02368
TELEPHONE: (617) 986-7500 / TELEFAX: (617) 986-1553

PROPOSAL

Date: June 8, 1993

TO: RUTGERS - STATE UNIVERSITY OF N.J.
page 2

Optional cluster lube. . . . . .$ 375.00

Optional single station automatic product loading accessory. . . . . .$ 4,200.00

Optional detect for automatic cycle start. . . . . .$ 900.00

Optional Nordson 3100 hot melt extruding system (should this be preferred vs standard daubing open pot system). . . . . $ 8,900.00

Optional recommended spare parts. . . . . $ 2,377.00

NOTE: Above quotation is for equipment ex-works, Randolph, MA. There is no provision for any local sales or use taxes. Delivery can be offered approximately 18 weeks (84 days) after receipt of this proposal (signed by customer), advance payment, and one sample for engineering purposes. In addition, we will then require 1,500 samples and a quantity of product for final testing and quality control purposes to be received at ECONOCORP a minimum of four (4) weeks before proposed ship date.

TERMS: 1/3 with order, additional 1/3 due upon acceptance prior to machine ship, balance 3%-30 days from ship date.

Installation and instruction (is) (~~xxxx~~) included in this quotation exclusive of travel and living expenses up to 2 days. Additional service will be offered at our regular per diem rates.

Terms: see above with order; balance due net cash 30 days from date of shipment.

Proposal: When signed by Buyer, and Seller accepts Buyer's offer by affixing signature, this proposal shall constitute a contract which shall be a Massachusetts contract, interpreted by the laws of the Commonwealth of Massachusetts, U.S.A., and in any and all ways treated as a contract entered into within the Commonwealth of Massachusetts, U.S.A. Any changes must be in writing and must be accepted by Seller in writing. There are not verbal, implied or expressed warranties or guarantees arising out of this proposal or subsequent contract other than those set forth herein. When an equipment specification schedule is attached, it is incorporated into this proposal or subsequent contract and is binding upon the parties.

Reservation: Seller reserves the right to revise this proposal in the event that Seller has not accepted Buyer's offer by affixing signature within sixty days of the date above written.

Electrical Requirements: 208 volt 60 cycle 1 phase

BUYER	SELLER
Name:	Name: ECONOCORP, INC.
Address:	Address: 72 Pacella Park Drive
Shipping Address:	Shipping Address: Randolph, MA 02368
Offered By:	Accepted By:
Title:	Title:
Date:	Date:

Attachment "A"

ECONOCORP INC
72 PACELLA PARK DRIVE / RANDOLPH, MA 02368
TELEPHONE: (617) 986-7500 / TELEFAX: (617) 986-1553

PROPOSAL

Date: June 8, 1993

TO: RUTGERS - STATE UNIVERSITY OF N.J.
University Procurement & Contracting
Administrative Services Annex Building Room 101
Davidson Road/Busch Campus
Piscataway, NJ 08855-6999

RE: RFP #3-5-18-1/ECONOSEAL SPARTAN

Base Bid: One ECONOSEAL SPARTAN cartoner including open pot thermostatically controlled hot melt glue system with dauber bar, caster mounting, sanitary construction (essentially stainless steel), USDA approval, lower perimeter stainless and upper surface Lexan guarding, ink print coding accessory, single station manual product loading area with dual button cycle start, and all necessary tooling for a full flap, seal-end style carton measuring approximately 4-7/8 x 5/8 x 8-1/4 inches. Machine to also include crating, freight (FOB Piscataway, New Jersey), and all training/education at customer's site for up to two (2) days. $31,950.00

Optional equipment:
Option for NEMA 4-washdown provision. . . . . $ 1,800.00

Installation and instruction (is) (is not) included in this quotation exclusive of travel and living expenses up to ..... days. Additional service will be offered at our regular per diem rates.

Terms: ..... with order; balance due net cash 30 days from date of shipment.

Proposal: When signed by Buyer, and Seller accepts Buyer's offer by affixing signature, this proposal shall constitute a contract which shall be a Massachusetts contract, interpreted by the laws of the Commonwealth of Massachusetts, U.S.A., and in any and all ways treated as a contract entered into within the Commonwealth of Massachusetts, U.S.A. Any changes must be in writing and must be accepted by Seller in writing. There are not verbal, implied or expressed warranties or guarantees arising out of this proposal or subsequent contract other than those set forth herein. When an equipment specification schedule is attached, it is incorporated into this proposal or subsequent contract and is binding upon the parties.

Reservation: Seller reserves the right to revise this proposal in the event that Seller has not accepted Buyer's offer by affixing signature within sixty days of the date above written.

Electrical Requirements: .....volt .....cycle .....phase

BUYER	SELLER
Name:	Name: ECONOCORP, INC.
Address:	Address: 72 Pacella Park Drive
Shipping Address:	Shipping Address: Randolph, MA 02368
Offered By:	Accepted By: .....
Title:	Title: .....
Date:	Date: .....

- machine as well as maintenance costs are minimal - minimum moving parts lead to ECONOSEAL's leading niche in the world market to satisfy moderate speed cartoning requirements with robust, yet lower level of sophistication for user friendly operation. In most cases, the machine operator easily handles any routine maintenance. Manufacturing moderate speed cartoning has been our only business since 1968.

I trust the enclosed information package is complete for your decision making purposes. I will be pleased to expand on any of these points by telephone if you have any questions. I look forward to hearing from you.

Very truly yours,

ECONOCORP, INC.

Mark Jacobson
Manager, Sales & Marketing

MJ/lmg
Enclosures

- and, complete manuals/video/technical support.

As requested during the pre-proposal conference, the base machine price, for this particular project, also includes an ink print coder (control print R252 series), crating, shipping, and all training and installation (for up to two working days), and single manual product loading station with safety dual button cycle start.

The enclosed proposal also itemizes the following options:

- NEMA 4 wash down provision;
- automatic product loading accessory - using this option, an operator is simply required to place product into a single loading bucket, and, upon pressing the dual button cycle start, the pouch is automatically transported into the erected and positioned carton.
- product detect for automatic cycle start - with this photo-eye arrangement, an operator is simply required to place product into the single product loading station and the machine cycle will start automatically. This option would be extremely useful should you wish to robotically feed this single product loading station and need the machine to have intelligence for automatic cycle start.
- Nordson 3100 hot melt extuding system - the base machine includes a thermostatically controlled, open pot, hot melt glue system with a daubbing bar to put on the continuous bead of hot melt, per your specification. However, if, for any reason, you prefer the hot melt extruding vs daubbing system, we have included this as an option.
- cluster lube;
- recommended spare parts.

It should also be noted that an intermittent motion bucket conveyor could also be added at a later date to tie in with the loader and cartoner. However, based on your anticipated single operator "off line" style packaging format, this option doesn't appear necessary at this time.

Other advantages of the ECONOSEAL SPARTAN cartoner to be considered for this project include:

- delivery - 12 weeks ARO;
- proven performance/reliability - the ECONOSEAL SPARTAN is the most popular cartoning machine model in the world (approximately 100 SPARTAN machines shipped per year. ECONOSEALS are shipped to more than 70 countries).

ECONOCORP INC
ORIGINATORS OF ECONOSEAL® CARTON SEALERS

72 PACELLA PARK DRIVE / RANDOLPH, MA 02368 USA / TELEPHONE (617) 986-7500 / TELEFAX: (617) 986-1553

June 8, 1993

Mr. Michael Dunn
RUTGERS - STATE UNIVERSITY OF N.J.
University Procurement & Contracting
Administrative Services Annex Building Room 101
Davidson Road/Busch Campus
Piscataway, NJ 08855-6999

RE: RFP #3-5-18-1/ECONOSEAL SPARTAN

Dear Mike:

Let me first thank you for the opportunity to provide an ECONOSEAL SPARTAN cartoning proposal for the above referenced project. I am pleased to acknowledge that ECONOCORP is in a position to comply with the May 10, 1993 specifications.

Please find enclosed:

- this cover letter/explanation;
- all documentation/forms;
- SPARTAN literature;
- SPARTAN plan and elevation view drawings; and
- formal machinery proposal.

The literature includes basic machine specifications and operating requirements. The proposal includes base machine description, options, prices, delivery, payment terms, and test materials required.

The ECONOSEAL SPARTAN is a heavy duty, mechanically driven, intermittent motion, horizontal cartoner. STANDARD machine features (base machine) include:

- sanitary construction (essentially stainless steel);
- USDA approval (official listed in USDA approval equipment book);
- thermostatically controlled hot melt glue system (open pot with dauber bar);
- caster mounting;
- lower perimeter stainless and upper surface Lexan guarding;
- lateral hand wheel adjustment for quick size change flexibility;
- four chain carton transport system to enhance carton squareness;

1. RETURN SIGNED QUOTATION IN A SEALED ENVELOPE. SHOW RFQ # ON OUTSIDE OF ENVELOPE.
2. IN EVENT OF THIS BID BEING ACCEPTED, A PURCHASE ORDER WILL BE SENT.
3. SEE REVERSE SIDE FOR TERMS & CONDITIONS.
4. ANY EXPENSE INCURRED BY THE BIDDER IN CONNECTION W THIS QUOTATION IS THE SOLE RESPONSIBILITY OF THE BIDD
5. IF QUOTE IS NOT F.O.B. DESTINATION, YOU MUST SHOW CC OF FREIGHT AS A SEPARATE ITEM.

ECONCORP INC
ATT CHUCK WHITE
72 PACELLA PARK DR
RANDOLPH MA 02369

DATE	THIS BID WILL BE OPENED:		
5/18/93	SEALED BID DUE JUNE 16, 1993	TIME: 2:00 PM	BY GEORGE THOMPSON, DIRECTOR OF PURCHASES

PLEASE QUOTE THE FOLLOWING F.O.B. DESTINATION

5. All cash discount terms will be acceptable, however, terms less than 30-30 days will n be considered in the proposal award.

6. Proposals should be returned in the enclosed Yellow Envelope or attach the Yellow envelope to the outside of a large envelope, if necessary. Telegraphic and facsimile proposals are not acceptable. Bidders must submit sealed proposals only. Any communication such as (facsimile transmittal) which reveals the contents of a sealed proposal will result in disqualification of entire proposal.

7. Proposal documents are to be submitted in ink, any price alterations ie. whiteouts, crossouts, erasures must be initialed otherwise the proposal will be rejected. (See number 17, terms & conditions)

8. ATTENTION BIDDERS
THIS ORIGINAL (LEGAL SIZE SHEET) REQUEST FOR PROPOSAL FORM "MUST" BE SIGNED AT THE BOTT AND RETURNED WITH PROPOSAL SHEET(S). YOUR ENTIRE PROPOSAL SUBMITTAL WILL BE REJECTED A DISQUALIFIED IF THIS FORM IS "NOT" SIGNED AND RETURNED ON OR BEFORE THE PROPOSAL DUE DA AND TIME.
FURTHERMORE BIDDERS WHO WISH TO REMAIN ON OUR "QUALIFIED" BIDDERS LIST SHOULD ALSO SIGN AND RETURN THIS PROPOSAL FORM INDICATING A REASON FOR NOT SUBMITTING A PROPOSAL.

9. Any addendums to this Request For Proposal must be acknowledged by signature below. Failure to comply will result in rejection of proposal.

You must sign below for each addendum received.

ADDENDUM: #1 _____ (Signature)
#2 _____ (Signature)
#3 _____ (Signature)

10. Bidders must comply with all proposal enclosures and must return certain enclosures wit proposal form. Photocopies of any required enclosures are not valid. Those indicated must have original signatures and notary seal. Failure to comply will result in rejection of proposal. They are:
(1) Affidavit (must be notarized)
(2) Non-Collusion Statement NCS-1 (must be notarized)
(3) PL 1977 C.33 (must be signed and returned)

11. A. Requirement to be provided by successful bidder after proposal award is made.
(1) Insurance, after award and prior to start of work
(2) PL 1975 C.127 within seven (7) days after receipt of purchase order
Note: "If awarded a contract your company/firm will be required to comply with the requirements of P.L. 1975 C.127. (NJAC 17:27)"

B. Supplemental Terms & Conditions, form STC-1 is a notice of requirement for compliance by bidder to whom an award is made and is to be retained by bidder.
Additional enclosures are: Bid You Sheet/Specifications/Sample

12. All Proposals submitted to Rutgers University, Procurement & Contracting will become public information as of the Proposal opening date and time.

REFER ALL QUESTIONS REGARDING THIS REQUEST TO:	NOTE: SHOW ALL TAXES AS SEPARATE ITEM	GRAND TOTAL ⇒
MICHAEL DUNN/h/908-932-5070		

THIS SPACE TO BE FILLED IN BY BIDDER

SHIPMENT CAN BE MADE IN 84 DAYS FROM RECEIPT OF ORDER	We quote you as above subject to the Terms and Conditions on this reverse.
F.O.B. Piscataway, New Jersey	SIGNATURE: Mark Jacobson
TERMS: 1/3, 1/3, 3%-net 30 days	PRINT NAME AND TITLE: Mark Jacobson, Manager Sales & Marketing — PHONE NUMB (617) 986-7500

S-002 Rev 6/

1. RETURN SIGNED QUOTATION IN A SEALED ENVELOPE. SHOW RFQ # ON OUTSIDE OF ENVELOPE.
2. IN EVENT OF THIS BID BEING ACCEPTED, A PURCHASE ORDER WILL BE SENT.
3. SEE REVERSE SIDE FOR TERMS & CONDITIONS.
4. ANY EXPENSE INCURRED BY THE BIDDER IN CONNECTION W THIS QUOTATION IS THE SOLE RESPONSIBILITY OF THE BIDD
5. IF QUOTE IS NOT FOB DESTINATION, YOU MUST SHOW C OF FREIGHT AS A SEPARATE ITEM.

ECONCORP INC
ATT CHUCK WHITE
72 PACELLA PARK DR
RANDOLPH MA 02368

DATE	THIS BID WILL BE OPENED:	TIME:	
5/18/93	SEALED BID DUE JUNE 16, 1993	TIME: 2:00 PM	BY GEORGE THORN, DIRECTOR OF PURCHASES

PLEASE QUOTE THE FOLLOWING F.O.B. DESTINATION

RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY requests proposals for the design, manufacture installation of a cartoning machine in accordance with the attached specifications and following notes:

NOTES:

A. MANDATORY PRE-PROPOSAL CONFERENCE/SITE INSPECTION
IT IS MANDATORY THAT ALL PROSPECTIVE VENDORS ATTEND THIS PRE-PROPOSAL CONFERENCE IN OR TO CLARIFY ANY SPECIFICATIONS/DETAILS AND ACQUAINT THEMSELVES WITH THE BID/PROPOSAL TO SUBMITTED. A PREVIOUS VISIT TO THE JOB SITE FOR WHATEVER PURPOSE, DOES NOT EXEMPT YOU FROM ATTENDING THIS MEETING. FAILURE TO ATTEND WILL DISQUALIFY YOUR PROPOSAL.

The Pre-Bid Conference will be held:

DATE: JUNE 2, 1993
TIME: 1:30 PM
LOCATION: FOOD MANUFACTURING TECHNOLOGY FACILITY, 120 NEW ENGLAND AVE., PISCATAWAY, N.

BIDS WILL NOT BE ACCEPTED FROM VENDORS WHO FAIL TO ATTEND THIS CONFERENCE.

B. Technical questions pertaining to specifications are directed to Mr. Theodore Doscovich at 908-445-6130. Questions pertaining to proposal procedures are directed to Mr. Mich Dunn at 908-932-5070.

C. The following areas must be addressed in detail with each proposal and will be consider in the evaluation: Delivery, performance, engineering features, cost, service and training.

D. Prices are to be F.O.B. Rutgers University Food Manufacturing Technology Facility, 120 New England Avenue, Piscataway, NJ. (Freight included)

E. Bidders are to submit three (3) copies of their proposal.

PLEASE INDICATE COST OF PROPOSAL AS FOLLOWS:

BASE BID - DOES NOT INCLUDE OPTIONS $ 31,950.00

DELIVERY & INSTALLATION 84 DAYS ARO.

---

1. Please note additional Terms & Conditions on reverse side of this sheet.
2. All Rutgers University terms and conditions will become part of any contract(s) awarded as a result of the Requests for Bid or Proposal, whether stated in part, in summary or reference. In the event the bidder's terms and conditions conflict with Rutgers, the Rutgers terms and conditions will prevail, unless the bidder is notified in writing of Rutgers acceptance of the bidder's terms and conditions.
3. It is the bidders responsibility to see that their proposal arrives at the University Procurement & Contracting Office before the proposal opening date and time.
4. Proposals delivered in person or by express service should be to our actual location. This location is: RUTGERS -THE STATE UNIVERSITY of New Jersey
University Procurement & Contracting
Administrative Services Annex Building/Room 101,
Davidson Road/Busch Campus, PO Box 6999, Piscataway, NJ 08855-6999

REFER ALL QUESTIONS REGARDING THIS REQUEST TO:	NOTE: SHOW ALL TAXES AS SEPARATE ITEM	GRAND TOTAL ⇨	
MICHAEL DUNN/h/908-932-5070			

THIS SPACE TO BE FILLED IN BY BIDDER

SHIPMENT CAN BE MADE IN 84 DAYS FROM RECEIPT OF ORDER	"We quote you as above subject to the Terms and Conditions on the reverse.
FOB Piscataway, New Jersey	SIGNATURE: Mark Jacobson
TERMS: 1/3, 1/3, 3%-net 30 days	PRINT NAME AND TITLE: Mark Jacobson, Manager Sales & Marketing — PHONE NUMB (617) 986-7500

Appendix 4.12

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS

Interdepartmental Communication

May 10, 1993

Food Mfg. Technology Facility
120 New England Avenue
Piscataway, Busch Campus

CRAMTD

TO: M. Dunn
Purchasing Dept.

FROM: T. Descovich TP

RE: Initiate Pre Bid Conference for Cartoning Machine

We would like to hold a pre bid conference for this equipment as soon as possible. Attached are the equipment specifications and a list of potential vendors with their representatives.

The criteria for selecting a proposal will be based on the following:

	Percent
Delivery	15
Performance	20
Engineering Features	25
Cost	30
Service	5
Training	5

cc: J. Rossen
J. Coburn
N. Litman

May 10, 1993

RFP#

The State University of New Jersey

RUTGERS

Cook College - Center for Advanced Food Technology

CRAMTD Program

Specifications

for

CARTONING MACHINE FOR MRE (Meal, Ready-to-Eat) POUCHES

This specification covers the requirements for a cartoning machine that will be used for the CRAMTD Program under STP #23 - MRE Pouch Qualification. The CRAMTD program demonstration site uses equipment for research and development of new packaging methods and materials.

This specification consists of the following sections:

1. Performance Requirements
2. Package Information
3. Design Requirements
4. General
5. Acceptance
6. Shipping and Installation

1.0 Performance Requirements

1.1 Operational Duty. The system shall be designed for continuous operation with a Minimum Operating Efficiency of 98%. Minimum Operating Efficiency is percentage of time that equipment performs at the specified rate. This equipment will operate in a typical washdown area.

CENTER FOR ADVANCED FOOD TECHNOLOGY
FOOD MANUFACTURING TECHNOLOGY FACILITY • 120 NEW ENGLAND AVENUE • PISCATAWAY • NEW JERSEY 08854

October 12, 1993

To: C.H. Wyckoff
Research and Sponsored Programs

From: J.F. Coburn
Director, CRAMTD

Subject: Equipment Subcontract to Econcorp, Contract No. DLA900-88-0383 Delivery Order 0008, CRAMTD STP #23 - "Pouch Qualification"

The formal proposal and review process for "Intermittent Motion Cartoner" for CRAMTD STP #23 has been completed. The proposal process was conducted through Michael Dunn, Senior Buyer, Procurement and Contracting Services. We have made a selection of Econcorp, Inc. as the proposed subcontractor of choice. The attachments include a memorandum which summarizes the negotiations with Econcorp, the proposal analysis, the four proposals received, and the Rutgers Specifications.

We would appreciate if you would please prepare the proposed subcontracting documents for the Econoseal Spartan cartoner as described in Econcorp Proposal dated June 8, 1993 and summarized below:

Econoseal Spartan (incl shipping/training)	$31,950
Option for NEMA-4	1,800
Cluster Lube	375
Automatic Loading Accessory (single)	4,200
Auto Cycle Detect	900
Recommended Spare Parts	2,377
TOTAL	$41,602

Please forward the letter requesting subcontract approval, along with the subcontract documents, to Mr. Vincent A. Morano, ACO, with copies to Mr. J.A. Lecollier, PCO, and Mr. R.K.H. Eggers, COTR. Mr. Eggers has already given his technical approval for the proposal and provided the technical assessment to the ACO.

Mr. Ted Descovich should be designated as the Rutgers/CAFT technical contact. Please do not hesitate to contact Ted or me for any additional information. We appreciate your help.

cc: T. Descovich
K. Danner
M. Dunn

				VENDOR EVALUATIONS			RFP 3-5-18-1		
Evaluation Criteria	**% Weight**	**ADCO Mfg**	**Score**	**Econocorp**	**Score**	**Hoyer**	**Score**	**Scandia**	**Score**
Delivery	15	98 days	13	84 days	15	90 days	14	120 days	8
Performance	20	20/min.	16	40/min.	18	45/min.	19	50/min.	20
Engineering Features	25	USDA listed - Nema 4	24	USDA listed-Nema 4	25	USDA construction-Nema 4	20	USDA construction-Nema 4	20
		castors		castors		castors		castors	
		semi-auto loading optional		semi-auto loading optional		manual loading		manual loading	
				optional automatic loading		optional automatic loading		optional automatic loading	
Cost *	30	$51770/$45,210 **	28	$50,502/$41,602 **	30	$55,900	26	$102,362	15
Service	5	1 year guarantee	4	1 year guarantee	5	guarantee not stated	3	1 year guarantee	4
				cartoners in 70 countries					
Training	5	2 days	4	2 days	5	$2500 provided	5	3 days	5
				video/technical support		detailed manual			
TOTAL	**100**		**89**		**98**		**87**		**72**

*** Cost includes the following:**

1. Base Machine
2. Semi-Auto Loader (if available)
3. USDA/NEMA 4
4. Spare parts
5. Shipping,Installation & Training
6. Nordson Hot Melt System
7. Cluster Lubrication

** Deduction for open pot hot melt system

Appendix 4.13

May 10, 1993

Vendors for Cartoning Machine

Vendor:	Representative:
Adco Manufacturing, Inc. 2170 Academy Sanger, CA 93657 (209) 875-5563	TechSystems, Inc. 46 Main Street Sparta, NJ 07871 Attn: Norman Milligan (201) 729-3125
Econocorp, Inc. 72 Pacella Park Drive Randolf, MA 02368 Attn: Chuck White (617) 986-7500	Fairway Packaging, Inc. 140 Lapp Road Malvern, PA 19355 Attn: Brian Jones (215) 384-6393
MGS Machine Corporation 9900 85th Ave. N. Maple Grove, MN 55369 Attn: Kerry Fillmore (612) 425-8808	Mach-Pak, Inc. 18 Arrowhead Drive Neshanic Station, NJ 08853 Attn: Dick Lyons (908) 369-3425
Bivans Corporation 2431 Dallas Street Los Angeles, CA 90031 Attn: Radford Bivans (213) 225-4248	A.G. Hornney Company 527 Main Street New Rochelle, NY 10801 Attn: Skip Hornney (914) 632-4900
Scandia Packaging Machinery Company 180 Brighton Road Allwood Station, Clifton, NJ 07012 Attn: James Brown (201) 473-6100	

Hoyer

Cost
Service
Training

4.7 Exceptions. The vendor may take exception to a part of this specification without being disqualified from consideration but is to clearly identify any exceptions taken.

4.8 Warranty. The vendor warrants the equipment performance specified herein for one year from the date of acceptance. The warranty includes all equipment and software supplied to be free from defects in materials and workmanship.

6.0 Acceptance

6.1 Acceptance Test. An Acceptance Test at Rutgers will be run to determine whether performance requirements have been met. The equipment will carton pouches for one hour at the guaranteed rate specified by the vender.

7.0 Shipping and Installation

7.1 The equipment will be shipped F.O.B., Rutgers University, Food Manufacturing Technology Facility, 120 New England Ave, Piscataway, NJ 08903.

7.2 The vendor will assemble and install equipment in full working order and provide training to Rutgers personnel in the operation and maintenance of the equipment.

Attachment: Sample carton

3.5 Construction. Cartoning equipment should meet USDA requirements for food handling equipment. The equipment shall be mounted on locking castors.

3.6 Electrical. Equipment should meet NEMA 4 requirements for washdown. The machine shall be wired for 120 or 208V with a twistlock 4 pole/5 wire plug and waterproof boot (Hubbell P/Ns 2811 and 6035).

3.7 Physical dimensions of equipment, including location of utility hookups are to be provided.

3.8 Cleanability. The equipment shall be designed for easy cleaning.

3.9 Safety. The vendor will provide equipment that is safe to operate. Safety guards, safety interlocks and emergency stop buttons are to be provided where required to prevent injury to operators.

4.0 General

4.1 Cost. The proposal is to include the total cost F.O.B. Rutgers University, Food Manufacturing Technology Facility, Piscataway, NJ. Cost of optional equipment, recommended spare parts, accessories and crating should be quoted but clearly delineated from base bid.

4.2 Delivery Schedule. The vendor will specify the delivery schedule.

4.3 Service. The vendor will provide service as needed to fulfill requirements of the warranty and these specifications.

4.4 Manuals. A set of manuals that document equipment operational procedure, maintenance and cleaning procedure will be supplied.

4.5 Drawings, Photos. A layout drawing of this machine shall be provided in both plan and elevation views. Additional drawings shall be provided as needed. Photos shall be provided as needed.

4.6 Award. The criteria for selecting a proposal will be based on the evaluation of the CRAMTD staff:

Delivery
Performance
Engineering Features

1.2 Primary Function. The cartoner will erect cartons from a magazine, place MRE pouches into cartons and glue both end flaps.

1.3 Production Rate. The system shall carton a minimum of 20 pouches per minute.

1.4 Material Handling. Pouches and cartons are to be handled without scratching or damage.

1.5 Operation. The cartoner is to operate manually or semiautomatically (with a loading mechanism). A semiautomatic machine shall be equipped with "no carton-no fill" feature.

2.0 Package Information

2.1 Cartons. A sample carton is an attachment to this specification. Finished cartons measure: 4.6875" x .625" x 8.25". Cartons shall be erected with adjacent sides square. Flaps are to be folded without damage. Each carton shall be closed by a continuous band of hot melt adhesive between the inner and outer flaps. The adhesive band shall extend from not more than 1/2 inch from each end of the flaps. Adhesive shall be applied carefully to prevent dripping on the pouch.

2.2 MRE Pouches. Meal, Ready to Eat pouches are made of flexible foil film. A pouch measures 4 3/4" x 5/8" x 8 1/8" and weighs approximately 8 ounces.

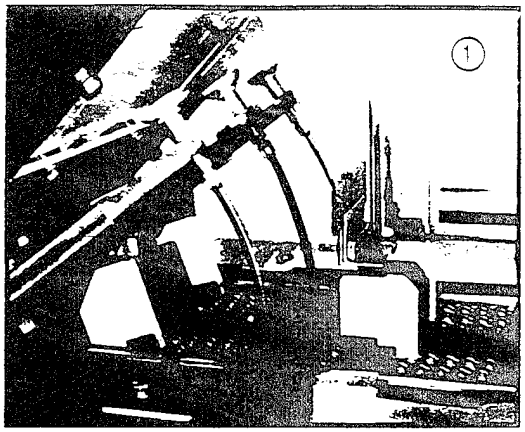
3.0 Design Requirements

3.1 Mechanical. The cartoner operation may be continuous or intermittent motion. An automatic loading mechanism should be quoted as an option. The cartoner should be adjustable through a range of package sizes.

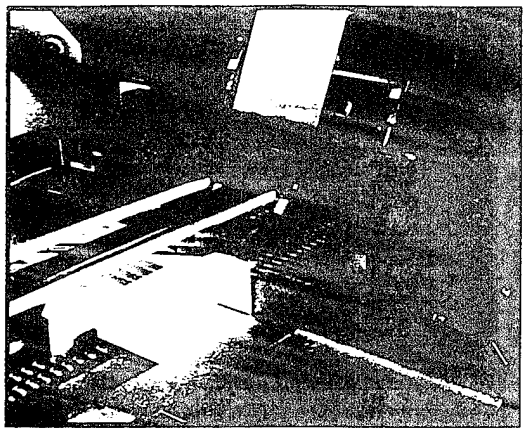
3.2 Pneumatic service up to 100 PSI. The vendor is to specify pneumatic requirements.

3.3 Labeling. A contact or non contact printer should be quoted as an option capable of placing a lot number code on the large side of the carton. The code will be 1/8 to 9/32 inch block letters, of up to 10 characters.

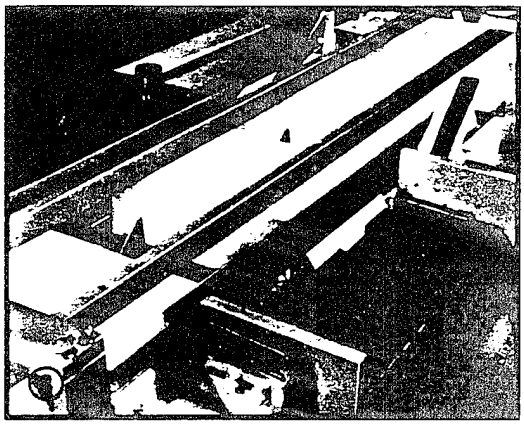
3.4 Controls. A manual load machine will be provided with operator hand switches. When a loading mechanism is used the equipment will operate automatically when a pouch is placed in the feeder.



Cartons pulled from magazine via vacuum.

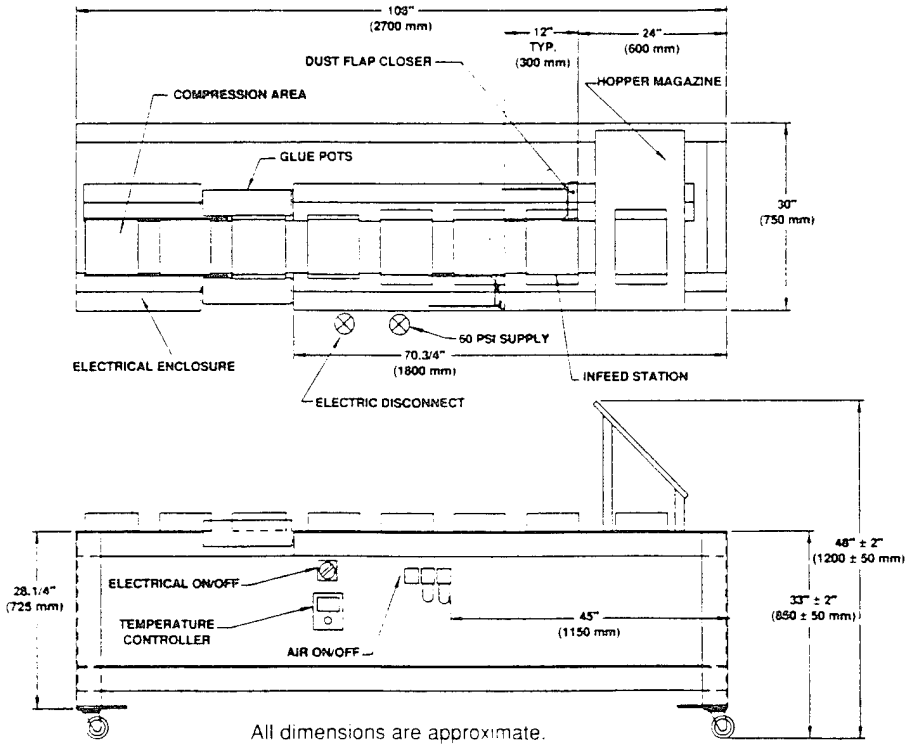


Carton presented to single load station. (Shown with manual loading; optional automatic loading available.)



Loaded cartons closed at both ends. (Shown with glue sealing; tuck closure also available.)

Carton Advance - Cartons ride on stainless steel deck. Total operation is made smooth and quiet with UHMW chain guides. Also shown is lateral hand wheel adjustment.



All dimensions are approximate.

ECONOSEAL SPARTAN CARTONER

Engineering Details

Size Range: (Carton Size)
Min. 2" x 1" x 5"
(51 x 25 x 127mm)
Max. 10" x 4" x 12"
(254 x 102 x 305 mm)

Speed: Up to 2400 cartons per hour depending on carton style and other factors.

Electrical: 220 volts, 50/60 Hz, Single Phase.

Air: 60 psi (4 bar). Volume consumption approximately 2.5 CFM (75 l/min.)

Shipping Weight: Normally less than 1900 lbs. (860 kg)

Machines available to handle carton sizes outside of range listed above quoted on request.

ECONOCORP INC.
72 Pacella Park Drive
Randolph. MA 02368
Telephone: (617) 986-7500
FAX: 617 986 1552

CENTER FOR ADVANCED FOOD TECHNOLOGY

Food Manufacturing Technology Facility
120 New England Avenue
Piscataway, NJ 08854
908/445-6130 FAX: 908/445-6145

TO: Fred Costanza/Natick

FROM: Ted Descovich/CRAMTD

DATE: September 9, 1994

RE: Qualification Run for Natick Evaluation of Reynolds Formable Film and Pouches Formed on the Tiromat 3000.- STP #23

For the qualification runs we will be producing 8 cases of ham slices and 8 cases of beef stew. We will be filling the 4.5 oz. ham slices in the 8 oz. pouch (4 3/4" x 8 1/8"). The ham will be from Berks Packaging which is commercial quality. Attached is the Berks Packaging label.

We have established an approved USDA process for this ham and it will meet or exceed the drain and net weight of the specifications. The ham size will be 2 3/4" x 4 3/8" x 5/8" thick.

Please let us know if these pouches will be satisfactory for your qualification testing.

cc: R. Eggers
J. Rossen
J. Coburn
R. Bruins
A. Sigethy
N. Litman

Date: 10/12/97.
Operator: JC

Tiromat Record Sheet

Time	10.49				
Pouch ID#	4285A				
Formula	Ham Slice				
~~Beef~~ HAM Lot Number	112				
~~Beef~~ HAM Temperature [C]	40°F				
~~Beef~~ Fill Weight [gram]	≥140				
~~Potatoes Lot Number~~					
Carrots ~~Lot Number~~					
Peas ~~Lot Numbers~~					
~~Vegetable Temperature~~ [C]					
~~Veg. Fill Weight~~ [gram]					
~~Sauce Batch Number~~					
~~Sauce Temperature [C]~~					
~~Sauce Viscosity~~ [cP]					
~~Raque Setting~~					
Oden Settings, A, speed/vol					
Oden Settings, B, speed/vol					
Oden Settings, C, speed/vol					
Sauce Fill Weight, "1R"					
Sauce Fill Weight, "2R"					
Sauce Fill Weight, "3R"					
Sauce Fill Weight, "1L"					
Sauce Fill Weight, "3L"					
Sauce Fill Weight, "3L"					
Tiromat Cycle Time ~~[sec]~~	[illegible]				

[illegible]

Bottom Web Lot Number	Bw-3				
Top Web Lot Number	Tw-3				
Pouch Preform Size [cc]	190cc				
Pouch Visual Inspection					
Vacuum Time [sec]	1sec				
Sealing Temperature [C]	210				
Sealing Time [sec]	1sec				
Retort Crate Number	151				
Retort Crate Start Fill Time	10:32 AM				
Pouches Produced [#]	283				
Pouches to QC [#]	—				
Pouch Defect Data	—				
Wrinkles *	[54]				
Abrasion					
Delamination					
Tears/Cuts					
Leakers					
Inadequate Seal Width					
Pouches to Retort (incl IT samples)	283				

* Rejected - opened - Recycled
* 21 pouches with seal wrinkle were also retorted (The actual # of good retorted pouches is 261).

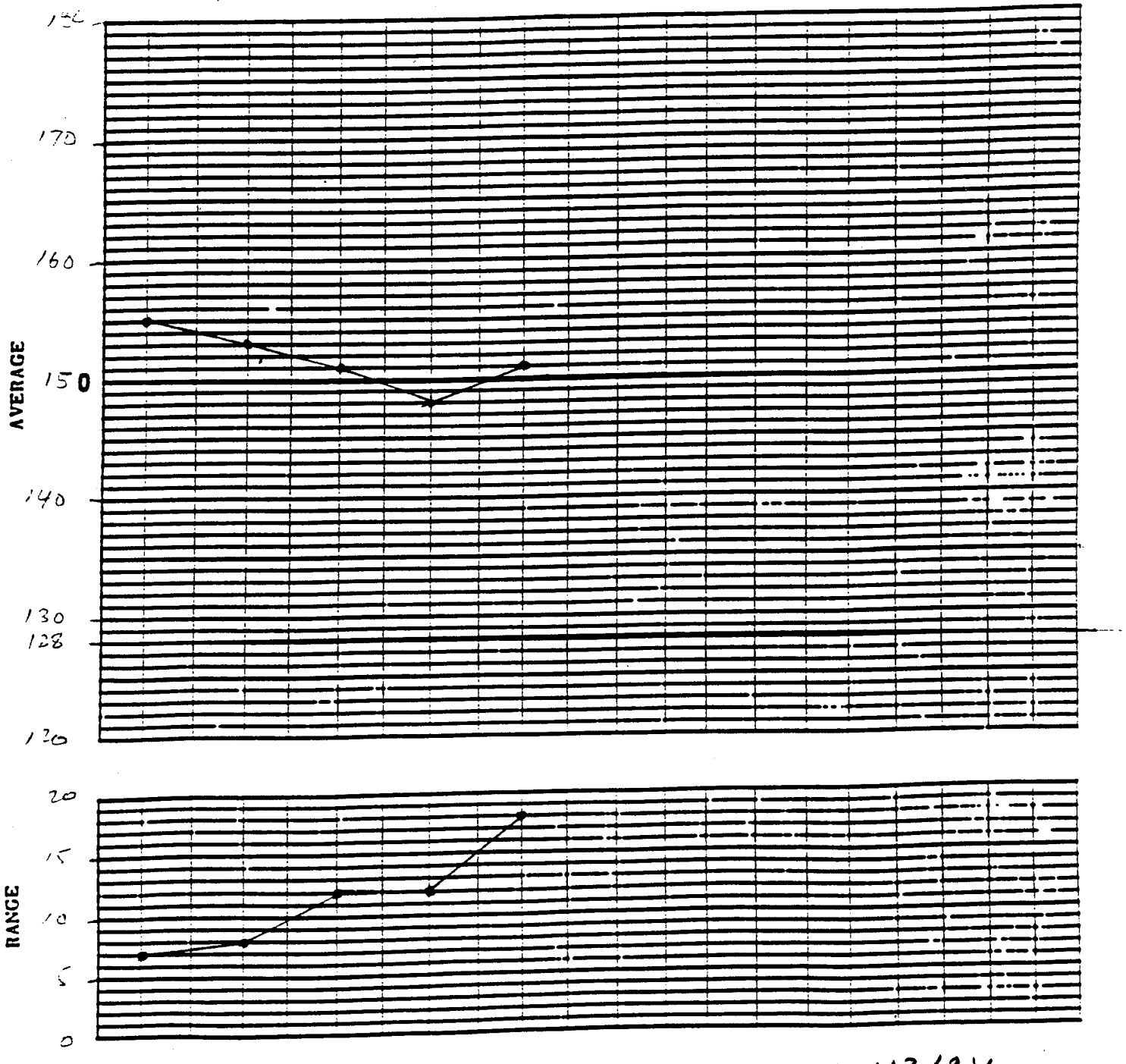
Pouch Coding Sequence

Sealing Station	1R	2R	3R	Forming Station
	1L	2L	3L	

NET WEIGHT CONTROL CHART

TIME					
	155	151	148	148	154
	156	156	146	152	153
	157	152	154	150	151
	154	148	149	147	141
	156	154	151	153	159
	152	151	158	141	151
SUM	930	916	906	891	909
AVERAGE	155	153	151	148	151
RANGE	7.0	8.0	12.0	12.0	18.0

$\bar{\bar{X}} = 151.6$



Product Ham Slice ..... X = ... Date 10/12/94.....

..... Checker ... Graham .....

RETORT RECORD SHEET

(Full Water Immersion)

Date: 12 Oct 1994

Retort Program Number	20		
Steam Pressure (psig)	98		
Container Type/Size	MRE - 8 oz.		
Product	HAM SLICE		
Remarks			
Process Data			
Retort Cook Number	R941012A		
Crate Number	151		
Type of Retort Rack	PP18		
Fill Time of Retort Crate	10:32 AM		
Label Crate Check Before Retort	ok Cook Clex		
Number of Pouches	282		
Product Code	Ham SLICE 4285		
Water Level Upper Drum	ok		
Initial Product Temperature	69°F		
Start Cooling	11:06:00		
Start Vent	11:06:34		
Start Come-Up-Phase	11:07:34		
Start Hold Phase	11:21:05		
Water Level Process Drum	ok		
Temp Reading (Time/MIG/RTD)	11:25/254°F 123°C 253°F	/ /	/ /
	11:30/253 122.4 252	/ /	/ /
	11:35/255 123.2 254	/ /	/ /
	11:40/254 122.6 253	/ /	/ /
Time fill at Tiromat 10:32	11:43/253 122.3 252		

22.1 Ret Temp
21.8 → steam valve open

Pressure Reading (bars)	2		
RPM	7		
Start First Cooling (Return) Phase	11:43:57		
Start Second Cooling Phase	11:46:38		
Start Drain	12:01		
Label Crate Check After Retort	dc		
Comments			
Operator Initial	LMC		
Process Reviewer Use Only			
Actual Come-Up-time	14½'		
Lowest Retort Temperature	251.5°F		
Actual Hold Time (Sterilization II)	22'		
Process Meets Scheduled or Alternate Process	yes		
Reviewer Initial	HMB		

Comments:

INTERNAL PR E TEST FORM

Date: 10/12/94

Lot #: 4285 A

Inspection Level S-2

Sample Number	Code Date	Seal #1 Failure (x)*	Seal #2 Failure (x)*	Seal #3 Failure (x)*	Seal #4 Failure (x)*	Total Pressure 20 PSIG (x) 30 seconds	Inspector	Action Taken/ By Whom
1	4285 A	-	-	-	-	X	Shaunta	None
2		-	-	-	-	X	"	
3		-	-	-	-	X	"	
4		-	-	-	-	X	"	
5		-	-	-	-	X	"	

*Any rupture or evidence of seal separation greater than 1/16 inch or seal separation that reduces the effective closure seal width to less than 1/16 inch shall be considered a test failure. Any test failure shall be cause for rejection of the entire lot. Mark failures with an (x).

Supervisor Signature

Date: 6/20/94
Supersedes: 5/13/93

RESIDUAL GAS VOLUME TEST FORM FOR POUCHES
Destructive Method

Date: 10/12/94

Lot #: 4285 A

Inspection Level S 2

Sample Number	Code Date	Actual Gas Volume (ml)	Technician	Failure (x)*	Action Taken (By Whom)	Number of Lot Rejected	Comments
1	4285 A	5.0	Shantie	-	None	None	
2		3.0	"	-	"	"	
3		3.0	"	-	"	"	
4		5.0	"	-	"	"	
5		5.0	"	-	"	"	
	Ave	4.2 cc					

PROCEDURE:

1. Immerse pouch in 75° ± 5°F water, collect gas by displacement in inverted graduated cylinder or calibrated tube.
2. Report gas volume to nearest 0.1 ml.
3. Maximum gas volume: Beef stew: 10.0 ml. Ham slice: 17.0 ml.

Note: Any test failure is classified as a major defect and requires rejection of the lot

Supervisor Signature

FINISHED PRODUCT EXAMINATION RECORD

(Ham Slice)

Date: 10/17/24

Lot #: 4285 A

Technician: Ibrahim

Specifications	Sample Number 1	2	3	4	5	6	Average
Visual: Foreign Material Off Odor Off Color	None	None	None	None	None		
Texture	ok	ok	ok	ok	ok		
Number Intact Pieces	1	1	1	1	1		1
Net Weight	151	147	151	141	152		148.2
Drained Weight: 1. Total	108	112	114	109	117		112.0
2. Cartilage, Ligaments, & Connective Tissue	1.0	—	1.0	—	—		0.4
Fat (%)	—	—	—	—	—		
Salt (%)	—	—	—	—	—		
Void Area (Air Pocket)	N	N	0.3x0.2"	N	N		
Bone Fragments	N	N	N	N	N		Total No. Bone Frag. N

Specifications: Net Weight. Individual sample (I) ≥ 113.0 g; Average of tested samples (Ave) ≥ 128.0 g.
Drained Weight. 1. Total: I ≥ 102.2 g; Ave ≥ 108.0 g.
2. Cartilage, Ligaments, and Connective Tissue ≤ 5.7 g.

Intact Pieces per pouch: one only
Fat (%): I ≤ 14.0%: Ave ≤ 12.0%
Salt (%): I = 1.5 - 2.5%
Void Area: ≤ 1/2 x 1/2 inch
Bone Fragments: Max. 0.3 inch long

Ave Yield: 75.6 %

Finished Product Inspection Report

Ham Slice

100% Pouch Inspection Reject Data **Date:** 10/12/94

Lot/Cook Number	4285A			
No. Retorted Pouches	261			
Minimal Seal Width	-			
Seal wrinkles	20			
Product Inclusions	-			
Abrasion	-			
Delamination	-			
Tear/Cuts	1			
No. Rejected Pouches	21			
No. Accepted pouches	240			
Comments				

Supervisor: JBBurn

Date: 6/2004
Supersedes: 5/1999

RECORD OF INCUBATION

Product	Code	Date	Size/Wt. (g)	Number of Containers		Date				Number Swollen	Comments/Action Taken
				Produced	Incubated	Put In (Date/Time)	Tech. Init.	Taken Out (Date/Time)	Tech. Init.		
Ham Slice	4285 A	10/12/94	128	240	5	10/12 4:00 pm	lbr.	10/24 3:00 pm	lbr	None	

Samples must be incubated at 95 ± 5°F for 240 hrs. All swollen containers require product of the same production code to be held until the reason for the swell has been thoroughly investigated.

CRITICAL FACTOR MONITORING LOG

HAM SLICE

PRODUCTION DATE 6/12/94

CONTAINER SIZE

INSPECTOR

Date	Product Code	Ham Fill Wt/g	Ham Thickness/cm	Pouch Closure	Residual Gas/cc	Hold Time/ min	Initial Temp/C	Pouch Config.	RPM	Come-Up Time/min	Incubation	Comment
6/12/94	4285A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	released

Instructions:

1. Record production date and container size.
2. Record date and product code.
3. Check and record the critical factors stated in the process table dated June 16, 1994, in the PQC manual, as follows:
   - Maximum ham fill weight. 175 g.
   - Maximum ham slice thickness. 3/4 inch (1.90 cm)
   - Maximum residual gas. 17.0 cc.
   - Maximum hold time. 2 hrs.
   - Minimum IT. 40°F (4.4°C).
   - Minimum RPM. 7
   - Minimum CUT. 14.5 min begins at the start of venting

Date: 6/20/94
Supersedes: New

Date: 5/13/93
Supersedes: New

RECORD OF DEFROST TIME

Ingredient	Lot Number	Put In Date / Time	Tech. Init.	Taken Out Date / Time	Tech. Init.	Total Defrost Time (hr)	Comments
Ref. Beef ½" cubes	RB4	Thaw Beef was pre		cooked in		refrigerated	
		the following day					

Appendix 4.17

FORMULA BATCH SHEET

Beef Stew Sauce (Pouches)

Date: 10/26/94

Prepared by: Sal

Raw Material Lot # Used	Ingredients	% of Ingredients	Quantity used (3)	1	2	3	4	5	6	7	8	9	Comments	Cook
-	WATER	83.51	15 Li	X										
ST-3	STARCH	4.81	870	X										
TP-2	TOMATO PASTE (30% solids)	4.81	798	X										
MG-3	MARGARINE	3.61	654	X										
P-2	MIXED SPICES	3.26	590	X										
Viscosity / cps:		At 90°F - from kettle												
		At ~~90~~ 52 °F - next day		16,800										
Sauce batch number				4299-1										

1. Check scale. Adjust tare for containres used in weighing ingredients.
2. Weigh out each ingredient individually.
3. Check off each ingredient as it is pre-weighed (x).
4. Test viscosity of final sauce. Record viscosity to nearest whole number in the square provided under each batch number.
5. See formulation details in manual for cooking procedures.

Beef Stew.

Tiromat Record Sheet

Date: 10-27-94

Operator: Sandra E. Cox

Time	10 AM				
Pouch ID#	4300				
Formula	Beef Stew				
Beef Lot Number	RB-4				
Beef Temperature [C]	Boiling Simmering				
Beef Fill Weight [gram]	92				
Potatoes Lot Number	PT-2				
Carrots Lot Number	CR-5				
Peas Lot Numbers	PE-2				
Vegetable Temperature [C]	Frozen				
Veg. Fill Weight [gram]	41				
Sauce Batch Number	4299-1				
Sauce Temperature [C]	52°F				
Sauce Viscocity [cP]	16800				
Raque Setting					
Oden Settings, A, speed/vol					
Oden Settings, B, speed/vol					
Oden Settings, C, speed/vol					
Sauce Fill Weight, "1R"					
Sauce Fill Weight, "2R"					
Sauce Fill Weight, "3R"					
Sauce Fill Weight, "1L"					
Sauce Fill Weight, "3L"					
Sauce Fill Weight, "3L"					
Tiromat Cycle Time [sec]	2 [illegible]				

Bottom Web Lot Number	[illegible]				
Top Web Lot Number	[illegible]				
Pouch Preform Size [cc]	[illegible]				
Pouch Visual Inspection	✓				
Vacuum Time [sec]	1				
Sealing Temperature [C]	215				
Sealing Time [sec]	.1				
Retort Crate Number	151				
Retort Crate Start Fill Time	10:10m				
Pouches Produced [#]	120				
Pouches to QC [#]	12				
Pouch Defect Data					
Wrinkles					
Abrasion					
Delamination					
Tears/Cuts					
Leakers					
Inadequate Seal Width					
Pouches to Retort (incl IT samples)	108				

Pouch Coding Sequence

Sealing Station	1R	2R	3R	Forming Station
	1L	2L	3L	

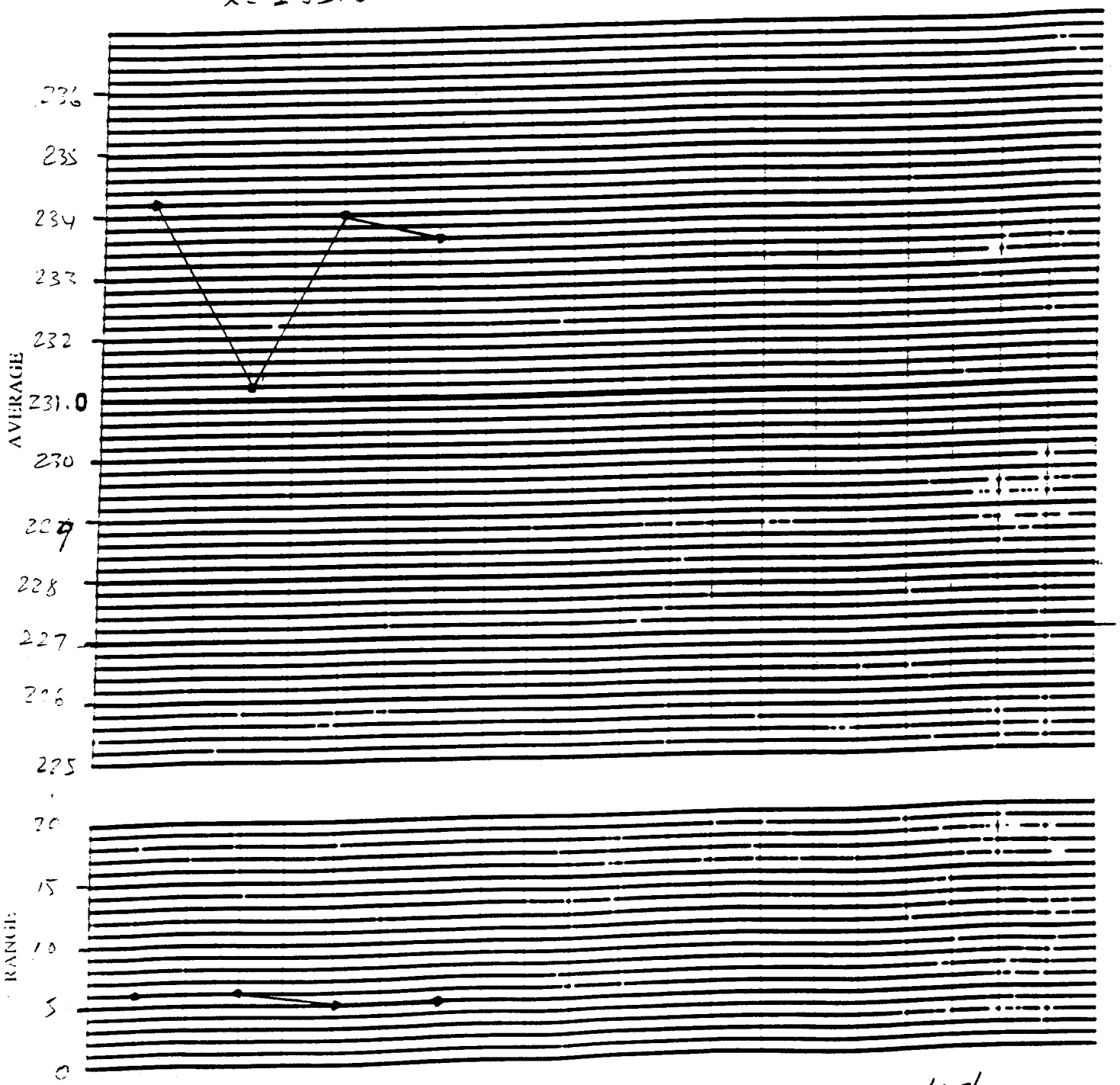
Installed new top film. Machine cleaned [illegible]

NET WEIGHT CONTROL CHART

Date: [illegible]
Supervisor: New

TIME				
	14.56	110 10	1/0 331	111.05
	1230	1231	1234	1232
	1235	1233	1235	1231
	1235	832	1232	1234
	1236	1233	1236	1236
	1235	1227	1231	1235
SUM	11171	11158	11170	11168
AVERAGE	1234.2	1231.2	1234	1233.2
RANGE	16.01	16 01	15.01	15.01

$\bar{X}$ = 233.3



Product 4300 Boulder
Label Weight 227 g
Tare ✓

X = ...
R = ...
Range .....

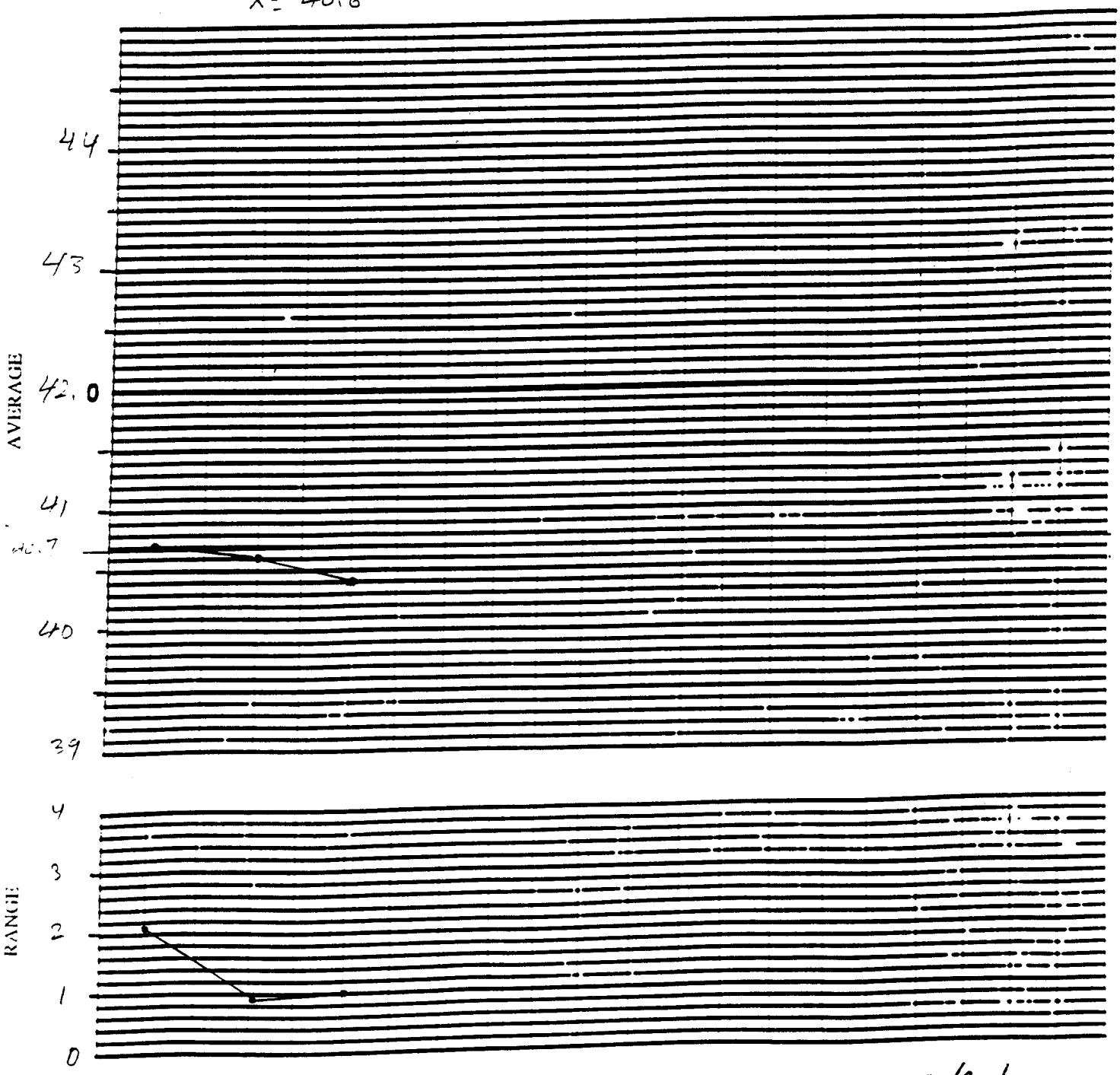
Date 6/27/94
Checker JBB
Line No. MRE

VEGETABLES FILL WEIGHT CONTROL CHART

Supersedes: New

TIME			
	110.65	110.20	10.40
	142.31	10.11	139.91
	140.31	141.01	140.31
	140.21	140.41	140.21
	140.21	140.21	140.91
	140.61	140.31	140.61
SUM	1203.16	1203.1	1201.19
AVERAGE	140.71	140.16	140.14
RANGE	2.11	10.91	11.01

$\bar{\bar{X}}$ = 40.6



Product 4300 Beef Stew

Target Fill Wt. 40.7

Tare

X =

R =

Range

Date 10/24/94

Checker HBB

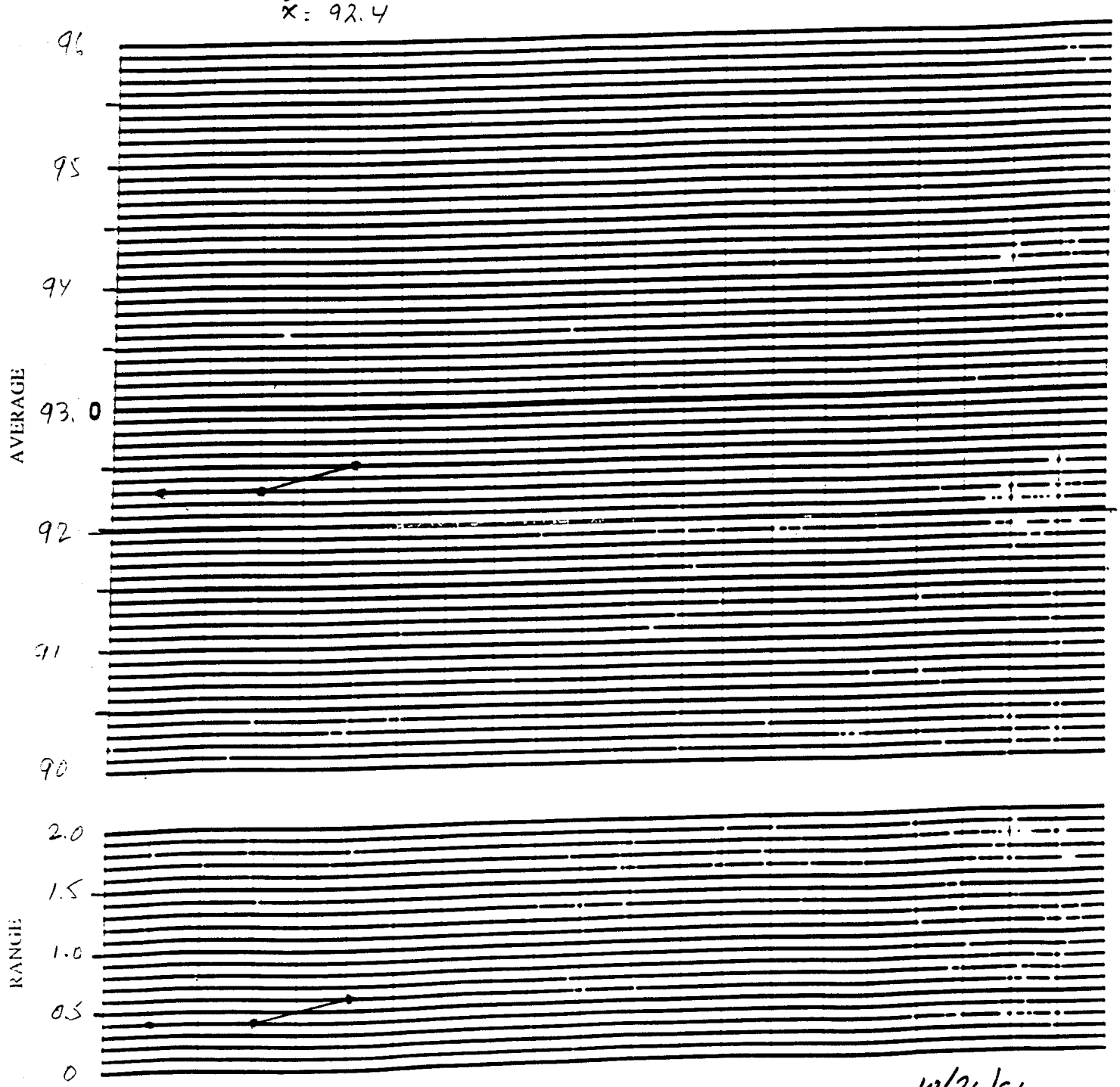
Line No. MRE

BEEF FILL WEIGHT CONTROL CHART

Supersedes: New

TIME			
	10:45	10:25	10:45
	92.2	92.3	92.6
	92.3	92.3	92.1
	92.6	92.6	92.7
	92.2	92.2	92.4
	92.2	92.2	92.7
SUM	461.15	461.16	462.5
AVERAGE	92.3	92.3	92.5
RANGE	0.4	0.4	0.6

$\bar{\bar{x}}$ = 92.4



Product 4300 Beef Stew

Target Fill Wt. 92.5

Tare

X = 92.4

R = 0.6

Range

Date 10/24/94

Checker HBB

Line No. MRE

Beef Stew

RETORT RECORD SHEET

(Full Water Immersion)

Date: 10-7-94

Retort Program Number	18		
Steam Pressure (psig)	110		
Container Type/Size	MRE 8oz		
Product	Beef Stew		
Remarks	none		
Process Data			
Retort Cook Number	R941027A		
Crate Number	151		
Type of Retort Rack	PP18		
Fill Time of Retort Crate	10AM		
Label Crate Check Before Retort	✓		
Number of Pouches	107		
Product Code	4300		
Water Level Upper Drum	OK		
Initial Product Temperature	50°F		
Start Cooling	11:20:45		
Start Vent	11:21:07		
Start Come-Up-Phase	[illegible]		
Start Hold Phase	[illegible]		
Water Level Process Drum	OK		
Temp Reading (Time/MIG/RTD)	11:[illegible]	/ /	/ /
	[illegible]	/ /	/ /
	[illegible]	/ /	/ /
	[illegible]	/ /	/ /

Pressure Reading (bars)	2		
RPM	7		
Start First Cooling (Return) Phase	11:59:10		
Start Second Cooling Phase	[illegible]		
Start Drain	1-:1Y:31		
Label Crate Check After Retort	✓		
Comments	none		
Operator Initial	[illegible]		
Process Reviewer Use Only			
Actual Come-Up-time	14½'		
Lowest Retort Temperature	251		
Actual Hold Time (Sterilization II)	24'		
Process Meets Scheduled or Alternate Process	yes		
Reviewer Initial	HMD		

Comments:

INTERNAL PR E TEST FORM

Date 10/27/94

Inspection Level S 2

Mill No. 4300 A

Sample Number	Code Date	Seal #1 Failure (x)*	Seal #2 Failure (x)*	Seal #3 Failure (x)*	Seal #4 Failure (x)*	Total Pressure 20 [illegible] PSIG (x) 30 seconds	Inspector	Action Taken/ By Whom
1	4300A	-	-	-		X	Hr	[illegible]
2.		-	-	-	-	X	Hr	"
3		-	-	-	-	X	Hr	"
	Pouches were tested also for internal Pressure before retesting, and pass[illegible]							

*Any rupture or evidence of seal separation greater than 1/16 inch or seal separation that reduces the effective closure seal width to less than 1/16 inch shall be considered a test failure. Any test failure shall be cause rejection of the entire lot. Mark failures with an (x).

Supervisor Signature

Date: 6/25/91
Supersedes: 5/13/91

RESIDUAL GAS VOLUME TEST FORM FOR POUCHES
Destructive Method

Date: 10/27/94

Lot #: 4300 A

Inspection Level S-2

Sample Number	Code Date	Actual Gas Volume (ml)	Technician	Failure (x)*	Action Taken (By Whom)	Number of Lot Rejected	Comments
1	4300 A	3.0	Sharila	-	-	None	
2		3.0	"	"	"	"	
3		2.0	"	"	"	"	
	Ave	2.7 cc					
Note	Residual	Gas was also measured before			voluntarily at the	Packaging room	
		3.0, 3.0, 2.0, 2.0			--> Ave	2.8 cc	

PROCEDURE:

1. Immerse pouch in 75° ± 5°F water, collect gas by displacement in inverted graduated cylinder or calibrated tube.
2. Report gas volume to nearest 0.1 ml.
3. Maximum gas volume: Beef stew: 10.0 ml Ham slice: 17.0 ml.

Note: Any test failure is classified as a major defect and requires rejection of the lot

M B Burns

Supervisor Signature

FINISHED PRODUCT EXAMINATION RECORD

(Beef Stew)

Date: 10/31/94

Lot #: 4300 A

Technician: Ibrahim

Specifications	Sample Number 1	2	3	4	5	6	Average
Visual: Foreign Material Off Odor Off Color	None	None	None	None	None	None	
Texture: Beef Vegetables	good	good	good	good	good	good	
Sauce: Consistency Color Scorched	good Brown None	good Brown None	good Brown None	good Brown None	good Brown None	good Brown None	
Net Weight	234	229	236	231	227	236	232.2
Drained Weight:							
1. Beef (Total)	69.0	68.5	70.5	67.5	70.5	69.5	69.0
- Intact Pieces	67.0	67.0	66.5	65.5	66.5	66.0	66.3
- Cartilage, Ligaments, & Connective Tissue	2.0	2.5	2.5	2.0	3.0	2.0	2.3
2. Vegetables	59.0	75.0	52.0	61.0	60.0	62.0	61.5
Fat (%)	-	-	-	-	-	-	-
Salt (%)	-	-	-	-	-	-	-
Bone Fragments	None	None	None	None	None	None	Total No. Bone Frag. N

Specifications: Net Weight. Individual sample (I) ≥ 212.6 g; Average of tested samples (Ave) ≥ 226.7 g.
Drained Weight. 1. Beef (Total): I ≥ 56.7 g; Ave ≥ 68.0 g.
- Intact pieces ≥ 42.5 g.
- Cartilage, Ligaments, and Connective Tissue ≤ 10.0 g.

2. Vegetables: I ≥ 34.0 g.; Ave ≥ 45.3 g.

Fat (%): I ≤ 10.0%; Ave ≤ 8.0%
Salt (%): I = 0.5 - 1.3%
Bone Fragments: Max. 0.3 inch long

Finished Product Inspection Report

100% Pouch Inspection Reject Data

Date: 10/2~ 9~

Lot/Cook Number	4300A			
No. Retorted Pouches	107			
Minimal Seal Width	1			
Seal wrinkles	1			
Product Inclusions	-			
Abrasion	-			
Delamination/ color changes ⊛	15			
Tear/Cuts				
No. Rejected Pouches				
No. Accepted pouches	90 **			
Comments	see below			

⊛ These 15 pouches were used for QC Tests

** ~ 25 of these pouches displayed a very slight color change which was accepted on the meeting held on the last week

Supervisor: [signature]

101091

Date 6/30/94
Supersedes 5/13/93

RECORD OF INCUBATION

Product	Code	Date	Size/Wt (g)	Number of Containers		Date				Number Swollen	Comments/Action Taken
				Produced	Incubated	Put In (Date/Time)	Tech. Init.	Taken Out (Date/Time)	Tech. Init.		
Beef Stew	4300A	10/27/94	227	90	3	10/27 3:00 pm	lbr	11/7 9:00 am	lbr	None	

Samples must be incubated at 95 ± 5°F for 240 hrs. All swollen containers require product of the same production code to be held until the reason for the swell has been thoroughly investigated.

CRITICAL FACTOR MONITORING LOG

BEEF STEW

PRODUCT Beef Stew

CONTAINER SIZE MRE

PRODUCTION DATE 10/27/94

INSPECTOR Rick

Date	Product Code	Batch ID	Formulat.	Beef Fill Wt/g	Vegt Fill Wt/g	Sauce Visc/cps	Pouch Closure	Residual Gas/cc	Hold Time/ min	Initial Temp/F	Pouch Config.	RPM	Come-Up Time/min	Incubation	Comment
	4300	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Instructions:

1. Record product's name, container size, and production date.
2. Record date, product code, and batch ID.
3. Check and record the critical factors stated in the revised process table dated May 21, 1993, in the PQC manual, as follows:
   - Maximum beef fill weight. 102 g.
   - Maximum vegetable fill weight. 44 g.
   - Maximum sauce viscosity. 17,200 cps @ 90°F - from kettle.
     52,900 cps @ 40°F - next day.
   - Minimum residual gas. 0 cc.
   - Maximum hold time. 2 hrs.
   - Minimum IT. 40°F.
   - Minimum RPM. 7
   - Minimum CUT. 12.5 min begins at the start of venting

Date: 10/08/93
Supersedes: 5/13/93

SMART System
Operating Program Listing
Date: 28-Oct-94
Time: 16:02:58

Operating Program Name: Pouch Quali for Ham
Program Creation Date: 19-Jul-94
Last Modification Date: 11-Oct-94
Operator For Modification: Generic Operator

Operating Program Information

Program Description: HAM SLICE MANUAL LOADING
Reason For Update:

Operating Program Configuration

Y/N	Component	Y/N	Component
Y	BF1 - Installed	N	BF1 - Positive Forming System
N	BF1 - Positive Forming - Air Assist	N	BF1 - Negative Forming System
Y	BF1 - Negative Forming - Air Assist	N	BF1 - Uniform Plug Installed
N	BF1 - Uniform Plug Locking Cylinder	Y	BF1 - Foil Forming System
N	BF1 - Lower Preheater #1	N	BF1 - Upper Preheater #1
N	BF1 - Independent Preheaters #1	N	BF1 - Lower Preheater #2
N	BF1 - Upper Preheater #2	Y	BF1 - Vacuum Pressure Sensor
N	BF1 - Air Assist Below Valve	Y	BF1 - Air Assist Above Valve
Y	BF1 - Vacuum/Air Vent	Y	BF1 - Standard Forming Vacuum Valve
Y	SS1 - Installed	Y	SS1 - Evacution By Timer
N	SS1 - Evacution By Vacuum Level	N	SS1 - Gasflushing By Timer
N	SS1 - Nozzle	N	SS1 - Evacuate Via Nozzle
Y	Punch & Die #1	Y	Punch & Die #2
Y	Punch & Die #3	Y	Onboard Vacuum Pump #1
Y	Trim Removal Vacuum Device	Y	Air-Driven Exit Conveyor
Y	Conveyor Active During Index Only	N	Package Marking System
Y	Upper Dancer Arm	Y	Lower Dancer Arm
Y	SS - Upper Web Brake #1	Y	BF - Lower Web Brake
Y	Stop Lamp	Y	Start Lamp
N	Product Dispensing Unit	N	Product Spill Protection Device
N	Product Vibrator	N	Product Temperature Sensor
N	Miscellaneous Device	Y	Video Jet Printer #1
Y	Video Jet Printer #2		

Index Parameters

Parameter Name	Value
Index Length (mm):	364.0 mm
Index Correction Factor (mm):	.0 mm
Index Speed [L/H]:	H
Ramp-Up Distance From Start (mm):	0 mm
Slow-Down Distance From End (mm):	0 mm
Low-Speed Camera Enable Distance From End (mm):	0 mm
High-Speed Camera Enable Distance From End (mm):	0 mm
Packages Per Cycle:	5
Forming Tools Counter:	2
Sealing Tools Counter:	2

Timer Set Points

Timer Description	Value
:F1 - Air Assist Forming Time	.00 Secs.
:F1 - Forming Time	1.00 Secs.
:B1 - Package Sealing Time	1.00 Secs.
:B1 - Upper Chamber Evac Time	1.00 Secs.
:B1 - Lower Chamber Evac Time	1.00 Secs.
:B1 - Evac Chamber Vent Delay	.50 Secs.
-S - Tool Separation Delay #1	3.75 Secs.
-S - Tool Separation Delay #2	.00 Secs.
-E - Miscellaneous Timer	.00 Secs.
ideo Jet Printer #1 Delay	.00 Secs.
ideo Jet Printer #2 Delay	.00 Secs.
-S - Start Warning Time	3.00 Secs.

Temperature Set Points

Temperature Description	Lower Limit	Set Point	Upper Limit
:B1 - Temperature	200 (C)	210 (C)	220 (C)

Pressure Set Points

Pressure Description	Lower Limit	Set Point	Upper Limit
-E - Incoming Oiled Air Pressure	60 PSI	100 PSI	120 PSI
:F1 - Air Assist Forming Pressure	8 PSI	11 PSI	20 PSI
:S - Seal #1 Pressure	10 PSI	75 PSI	90 PSI

Forming Vacuum Pressure Set Points

Pressure Description	Lower Limit	Set Point	Upper Limit
:F1 - Forming Vacuum Pressure	1.0 PSI	6.0 PSI	15.0 PSI

Heater PID Parameters

Heater Name	Gain Factor	Integral Factor	Derivation Factor
:B1 - Heater	60.00	1.00	.25